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DECEMBER

FEATURES

24 Tech Watch List
Find out what you'll be running in your rig in 2009—and beyond.

47 GIMP
We show you how to do it all with this free photoediting software!

62 Netbook Roundup
How do these mini-notebooks match up with the big boys?

DEPARTMENTS

QuickStart

08 NEWS T-Mobile announces the first Android-based mobile phone

14 THE LIST Seven things that can help Linux overtake Windows

16 DEATHMATCH Chrome Beta vs. Internet Explorer 8 Beta

R&D

70 WHITE PAPER An in-depth look at virtual machines

71 AUTOPSY Belkin Vision N1 Router

74 HOW-TO Troubleshoot and optimize your Internet and network connection

In the Lab

83 REVIEWS

97 LAB NOTES

104 RIG OF THE MONTH

62

LETTERS

20 WATCHDOG

80 DOCTOR

102 COMMENTS

MAXIMUM PC

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The Short Film Regains Its Luster

As I write this, we're starting to see the machinations of Microsoft's massive makeover, a multi-million-dollar ad campaign designed to reinvigorate Microsoft's stodgy image. So far, we've seen three prongs of the company's attack—the Mojave Experiment, the comic stylings of Gates & Seinfeld, and the "I'm a PC" ads.

In the Mojave Experiment, Microsoft employees interview people about Vista. Invariably, the nontechnical folk parrot common Vista complaints: It's slow, it sucks, yadda yadda. Then, they're invited to try out the next Microsoft OS, code-named Mojave. Universally, these Vista-haters praise Mojave's ease of use, speed, beauty, and surprisingly pleasant odor. The big reveal is that Mojave is actually Vista. While I agree that it's unfair to punish Vista for flaws fixed almost a year ago, this shameless "we're right and everyone else is wrong" marketing seems juvenile—like something a nerdy high-school kid would come up with to launch himself into the social stratosphere.

While Mojave left a sour taste in my mouth, the Gates & Seinfeld spots are clever and funny enough that they're making a slow burn into the nerd psyche. On the first viewing, the spots may disappoint and confuse. You wonder what you just watched, what product the ad was for. But on the second and third viewings, you realize that they're complex tapestries, with Seinfeld's classic jokes layered on top of sight gags, which in turn, are coated by in-jokes; all of this is covered by a thin veneer of typical American buddy comedy. Or they could just be moderately clever bits about nothing in particular. Either way, they work.

REEL KILLERS

For the Birds

❋

The Man Who Walked Between the Towers

❋

I Met the Walrus

However, these aren't really ads. Despite airing on television, in the evenings, between two segments of a TV show, they are not advertisements. No siree. With both of the already published spots clocking in on the high side of four minutes, these are short films. Internet short films.

That's right, with hundreds of millions of dollars to spend, Jerry Seinfeld's comedy genius, and Bill Gates playing the ultimate straight man, Microsoft's unstoppable marketing machine's plan to recapture the imagination of the Windows power user elite is YouTube clips. YouTube clips featuring discount shoes. And churros. And leftovers with cheese on them. OK, so they're pretty awesome YouTube clips. But still, very little is fundamentally different from that video of Will Ferrell yelling at the baby.

And you know what? It's a wonderful thing. Thanks to YouTube, more people are making and watching short films than ever before. Whether it's on iTunes, YouTube, or wedged between segments of *Big Brother*, the short film is making its triumphant return to the zeitgeist, and I like it.

Now, I'm going to go find a churro.

Will Smith

LETTERS POLICY Please send comments, questions, and a churro to will@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Unfortunately, Will is unable to respond personally to all queries.

THE NEWS

Android Arrives

Move over, iPhone: The first handset for Google's open-source mobile OS to be released October 22 —TOM EDWARDS

For more than a year, Apple's iPhone has garnered the lion's share of press and remained a must-have device of gadget junkies. In an industry in which $300 products quickly become free incentives for signing a contract, the iPhone's enduring relevance is noteworthy. Its popularity is due in part to Apple's marketing savvy, which has made many people—consumers and journalists alike—look past the device's shortcomings, but also because the iPhone's innovative interface and full web browser offer consumers something truly new.

Now, handset-maker HTC, T-Mobile, and Google hope to get some of the attention the iPhone has received by releasing the G1, the first mobile phone to use Google's open-source mobile OS, Android.

Physically, the G1, at 4.6"x2.16"x.63", is slightly larger than the iPhone. However, it also includes a full slide-out QWERTY keyboard. Additionally, it has a trackball for navigation and dedicated web-browsing buttons. A 3.1MP camera, 1GB of storage, and a 480x320 screen round out the phone's offerings. The G1 is currently available for preorder; online and retail sales begin on October 22. The G1 will retail for $179 with a two-year contract.

The G1's most interesting feature is the integration of a compass with Google Maps' Street View. With the compass activated, the Street View image on the phone will align with the direction you point the phone and adjust as you move. The phone's music player links not to the iTunes stores but rather Amazon MP3, Amazon's digital music store, which sells only DRM-free MP3s; single songs cost 89 cents. The device does, however, have shortcomings, the most noticeable of which is a lack of Microsoft Exchange and desktop sync support. Lack of a nonproprietary headphone jack also seems like an oversight.

Interest in Android has been brewing since Google released the SDK back in January 2008 as part of the Android Developer Challenge, which awarded cash prizes to the makers of the best Android mobile apps. Google is allowing anyone who registers with the company to upload a program to Android Marketplace. While this will ensure that numerous apps of dubious quality make it to the marketplace, Google hopes the included user rating system will help worthy apps flourish. For the time being, all apps on Android Marketplace are free.

The G1 is the first mobile phone to incorporate a compass.

The G1 will be exclusive to T-Mobile. The smallest of the major U.S. carries, T-Mobile has lagged in its development of a 3G network; however, the company recently announced the launch of such a network in 27 U.S. cities. Two G1 data plans were announced at launch, a $25 unlimited data plan and a $35 unlimited data and text plan. However, at the launch press conference, officials said consumers would be unable to use the G1 as a modem.

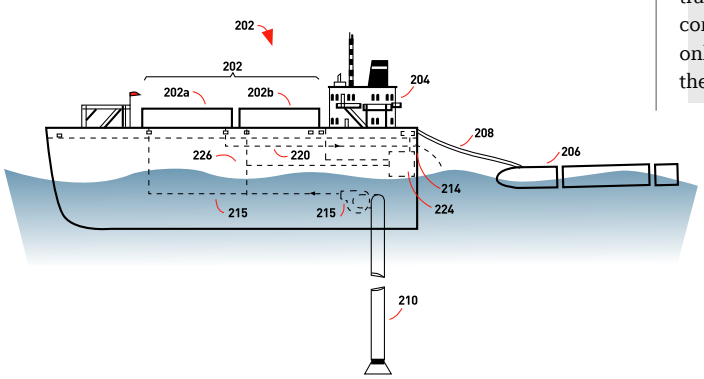
Unlike the iPhone, Android handsets will not be limited to a single carrier. Google, of course, wants to make sure that Android phones are available on as many wireless networks as possible because the company will generate income through ad revenue as people use the phones to go online. Because Android handsets will be made by numerous companies and eventually be available on a number of different networks, Android-based phones will not provide a singular experience—and some wireless providers may even choose to strip functionality from phones.

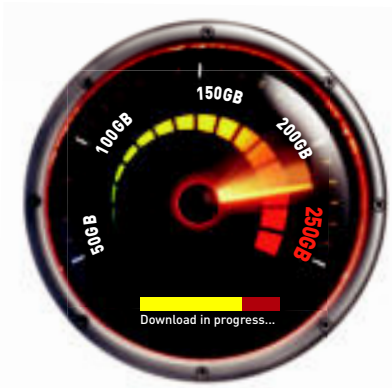
How this launch will affect the relationship between Apple and Google is unclear. The iPhone integrates a number of Google products, including YouTube and Google Maps, and Eric Schmidt, Google's CEO, sits on Apple's board of directors. Until now, the companies have not competed head to head.

LEARN MORE AT MAXIMUMPC.com
http://www.tinyurl/3g9thv

Google to Hit the High Seas

The recent discovery of a patent Google filed in February 2007 is prompting speculation that the company plans to establish large data centers at sea. The idea makes a lot of sense. By using ships to house computing centers just three to seven miles offshore, the company saves big on real estate costs and can harness the ocean to both generate electricity with a Pelamis Wave Energy Converter and provide cooling to the hot hardware. Not only could the ships be easily deployed and moved according to need, but the patent describes a modular design using cargo containers that would make it possible to add and remove computing resources at will. **–KS**





Rip DVDs Legally

RealNetworks's new RealDVD software, which is still in beta, finally gives users a way to copy their DVDs on the up-and-up. Besides being legal, the program trumps illegitimate apps with its easy, one-click method for importing a DVD's contents—including menus, extras, metadata—to a hard drive, albeit in an uncompressed format. What might dissuade converts is the file's proprietary format, which can be played only with RealDVD's built-in player on a PC (a rip can be played on up to five machines, each requiring its own individually purchased copy of the $30 to $50 program).

RealDVD transfers the original disc's DRM to ripped copies and adds another layer of copy protection to boot, to keep the file from being used otherwise. While constraining, such measures are the only hope RealNetworks has of avoiding the entertainment industry's notorious wrath. **–FI**

Comcast Caps Bandwidth

The 250GB bandwidth cap Comcast announced for residential consumers in August goes into effect October 1. Comcast says less than 1 percent of users actually exceed the limit, which is meant to curb excessive bandwidth use by a handful of high-traffic customers. A first infraction results in a warning; a second offense within six months leads to suspension of service.

Despite the new rule, Comcast isn't making it easy for consumers to monitor their bandwidth use. The company suggests installation of third-party router firmware or the monitor included in its free McAfee security suite—neither of which compares to seeing the same metering numbers Comcast is using. When asked about a more transparent solution, company reps would only say, "Expect one in the future." **–NE**

If your computer crashes more often in an airliner or a high-altitude city like Denver, don't be too quick to blame the software. You may be the victim of an attack from outer space.

Welcome to the Twilight Zone of "soft errors"—momentary hardware faults, not manufacturing defects or permanent malfunctions. The leading cause of soft errors is cosmic rays. Our planet is constantly bombarded by these rays, which are actually storms of subatomic particles.

These particles have great penetrating power. Billions are passing harmlessly through your body right now. But when they hit a transistor in a microprocessor or memory chip, they can reverse the transistor's state from zero to one, or vice versa, resulting in a transient error. It can crash a program or even the whole computer.

Soft errors are more likely at high altitudes. In Denver, Colorado, one mile above sea level, neutron flux is six times greater than it is in a coastal city like San Francisco. In an airliner cruising above 30,000 feet, neutron flux can be 100 times greater than at sea level. These differences are significant. In 2004, a huge 2,048-processor computer system kept crashing at Los Alamos National Laboratory in New Mexico (7,000 feet above sea level). The problem was traced to cosmic rays scrambling the processors' caches.

Another culprit is earthbound alpha radiation. Years ago, chips from IBM and Intel suffered mysterious failures. It turned out that radioactive materials from distant uranium mines and chemical plants were contaminating the chips' packages during manufacture.

Smaller transistors are more susceptible, so the problem worsens as chip-fabrication technology advances. Error-correction circuitry is one solution, but it adds complexity and cost. Some critical systems run multiple copies of the same program in parallel—a majority vote decides which results are accepted as correct. However, that solution multiplies power consumption.

In PCs, buggy software is so rampant that it masks the soft-error problem. Who can say why your machine crashed? But soft errors are becoming such a threat that chip designers are adding more error-correction circuitry, despite the cost.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.

Nvidia Blinks on SLI

Company changes stance on SLI with Intel chipsets

In the battle of wills between Intel and Nvidia, it was Nvidia that budged. The company reversed course and said it would offer SLI support on motherboards that use Intel's upcoming X58 chipset, without making its nForce 200 chip part of the bargain.

Previously, Nvidia said SLI support would be possible only if board vendors purchased and integrated the company's nForce 200 chip—a proposition vendors found objectionable due to the costs and thermal issues, according to news agency DigiTimes. Motherboard vendors that *Maximum PC* spoke to all said they were looking at SLI on X58, but none had committed to it. With the Pentium 4 and Core 2, Nvidia offered SLI support through its own nForce chipsets, but the company said it has no plans to offer an SLI chipset for the first iteration of Core i7.

SLI will return to Intel chipsets for vendors who have their boards certified by Nvidia.

THE COMPANY DIDN'T WANT ATI TO BE THE ONLY MULTI-CARD SOLUTION AT THE CORE i7 DANCE.

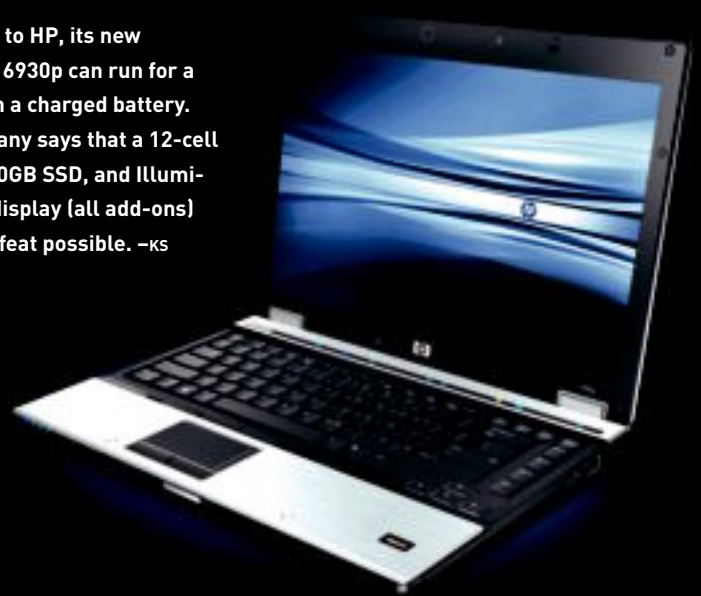
The change doesn't mean everyone will get SLI. Nvidia said it's only offering SLI to vendors whose boards are certified to run SLI before the drivers enable multi-card use.

Nvidia didn't say why it changed course, but it isn't hard to guess: The company didn't want ATI to be the only multi-card solution at the Core i7 dance. **–GU**

CHARGED UP!

HP's 24-Hour Notebook Battery

According to HP, its new EliteBook 6930p can run for a full day on a charged battery. The company says that a 12-cell battery, 80GB SSD, and Illumi-Lite LED display (all add-ons) make the feat possible. –KS



GAME THEORY

An Intelligently Designed Game

For a little while, AntiSpore.com had some folks in the gaming community convinced that fundamentalist Christians were whipping up outrage over Spore's depiction of evolution. Although it was finally revealed as a hoax (perhaps even viral marketing), it sounded a familiar note in contemporary culture.

Some people of faith might indeed pause over Spore, wondering if it's little more than the game version of a Richard Dawkins screed. It's not, but evolution and religion are two subjects that are always handled with more heat than light, possibly even *in this very column*. Believers have had evolutionary fundamentalism shoved down our throats for quite some time now, so we've gotten a bit weary of the subject.

I've sat at a table at which one person basically argued that all life just kinda happened, while another insisted that the Earth is only 6,000 years old. As a conservative Catholic whose approach to reason is guided by St. Thomas Aquinas, both extremes drive me batty. I teach Church history and theology to teenagers, and they're so conditioned by the extremes of the debate that they're surprised to learn that elements of evolutionary theory are compatible with our faith. The author of the Big Bang theory and the father of genetics were both Catholic priests. Faith and science are not at odds: They both seek truth.

For his part, Will Wright punts on the question of the origin of life on Earth, depicting a panspermia/exogenesis model. That is, life did not spontaneously arise on Earth, but came from space. Thus, he doesn't need to speculate on the ultimate origins of life. Because we have no idea whatsoever how life began, and since it provides a tidy motif for the game (life comes from space and is constantly struggling to return), this was a wise choice.

On the other hand, some evolutionists are claiming that Spore is nothing more than creationist boosterism. They have a point. Your critter isn't going to sprout claws on its own. It needs to be designed, and the need for design presumes the need for a designer, and an intelligent one, at that.

Thomas L. McDonald has been covering games for 17 years. He is an editor at large for *Games* magazine.

GEEK TESTED & DISAPPROVED

Sumo Omni Plus

We've planted our tushes on a fair number of bean bags over the years, but we've never found one that's offered the right combination of size and comfort. We like the portability of Sumo's flagship Omni bag, but not the mess that results from replenishing its inner Styrofoam beads. The new Omni Plus ($200, www.sumolounge.com) is filled with shredded urethane foam (aka memory foam), which slowly decompresses after use. The bag never goes flat and you never need to replace the filling, but the pillow-like form factor isn't optimal for use as a chair. This bag is better for napping than gaming. –NC

Nvidia Sued over GPUs

Investors say graphics company withheld data on defective parts

Two separate shareholder lawsuits against Nvidia accuse the company of not telling investors about pending GPU failures in notebook computers.

Both suits allege that Nvidia knew of the problem for several months and put its shareholders at risk by withholding the critical information. In July, Nvidia reported it would take a $200 million charge to pay for the bad GPUs. The company s stock has since fallen from $39 a share to $8.

Nvidia has blamed the problem on packaging used in the mobile GPUs and maintains that only a small number of parts are impacted. Dell has gone so far as to automatically extend warranties on a large number of notebooks with Nvidia GPUs. –GU

High failure rates of mobile GeForce parts have cost Nvidia at least $200 million.

IP Infringement and You

With a 14-4 approval vote by the Senate Judiciary Committee, the Enforcement of Intellectual Property Rights Act of 2008 welds elements from both the PRO-IP Act and the PIRATE Act to form the Godzilla of all copyright bills. Here's what's in store for future copyright enforcement.

The proposed legislation offers some new safeguards for the accused, as well as "virtual bystanders," by mandating a protective order on any forfeited property of an IP infringement case, meaning the discovery and use of any private impounded information may not be improperly disclosed or used.

More controversial is a provision in the bill that allows the Department of Justice to enforce civil suits against IP infringers, yielding any damages awarded to the copyright holders. In other words, taxpayer money would go toward providing legal services for the content owners.

A further provision tacked onto the end of the bill suggests that the attorney general give special attention to cases of software piracy that involve "willful theft" for the benefit of financial gain, ostensibly moving your average P2P downloader to the end of the DOJ's to-do list. –BH

BYTE RIGHTS

QUINN NORTON

Sample This, Lawman

What do N.W.A.'s "Straight Outta Compton," *Futurama*, the Powerpuff Girls, and Aphex Twin have in common? Only two things: their appearance on ironic hipster T-shirts and the Amen break.

You can be forgiven if the term "Amen break" is unfamiliar, but you definitely know the sound. It's a sample that's appeared all over in the last 20 years, from hip-hop to movies to commercials. It's helped define genres. It's pretty much the drum part of drum and bass.

The Amen break comes from "Amen Brother," the B-side of a single released in 1969 by a band called the Winstons. The break is all of six seconds long—yet people ripping it off transformed it into a musical institution. All without any permission from the Winstons.

Had the Winstons demanded licensing and sent out cease-and-desists what might have (not) been?

The people that used the Amen break early on might not have cared. Even the RIAA's most bulldog of lawyers might not balk at negotiators for whom the AK-47 is a tool. But the Amen represents what a sample set free of copyright enforcement could do. Sampling has been at the heart of new music movements ever since.

The chance of another Amen break revolution these days is slim. In 2005 the 6th Circuit Court of Appeals (which covers Tennessee, Kentucky, Michigan, and Ohio) got a case in which the very same N.W.A. that gave the Amen break such prominence with "Straight Outta Compton" in 1988 was sued for using another sample. This time is was a two-second chord from a Funkadelic song. Yes, a mere three notes—there was very little grace in Graceland. The court explained that enforcement was easier if almost nothing was too small to prosecute.

They were blunt: "Get a license or do not sample." They added: "We do not see this as stifling creativity in any significant way." Methinks the 6th Circuit doth protest too much.

But good luck with that easy enforcement—sampling has punk spirit, culminating in the wildly creative and forever illegal mash-up scene. I might not ever be able to buy this music, but I don't have to.

Quinn Norton writes about copyright for Wired News and other publications. Her work has ranged from legal journalism to the inner life of pirate organizations.

THE LIST

Seven Things That Can Help Linux Overtake Windows

7 IMPROVE POWER MANAGEMENT ON MOBILE

6 ENSURE THAT ALL VIDEO PLAYBACK IS SEAMLESS AND EASY

5 RUN WINDOWS APPS

Sometimes you just need to run a Windows app, and there's no Linux alternative.

4 INCLUDE BETTER APPS FOR HOME USERS

Many Linux apps target businesses. Home users need photo-management tools and a music library.

3 DEVELOP KILLER NATIVE APPS

A handful of Windows and OS X apps are beyond popular. To truly compete with established players, Linux needs native Photoshop and Outlook.

2 CONFIGURE THE OS WITHOUT A TEXT EDITOR

Requiring manual configuration of the Xorg.conf file is inexcusable in 2008.

1 LAUNCH A CATCHY PR CAMPAIGN

Run a series of Linux vs. Mac ads on TV that feature Justin Long and a guy with a sweet neck beard.

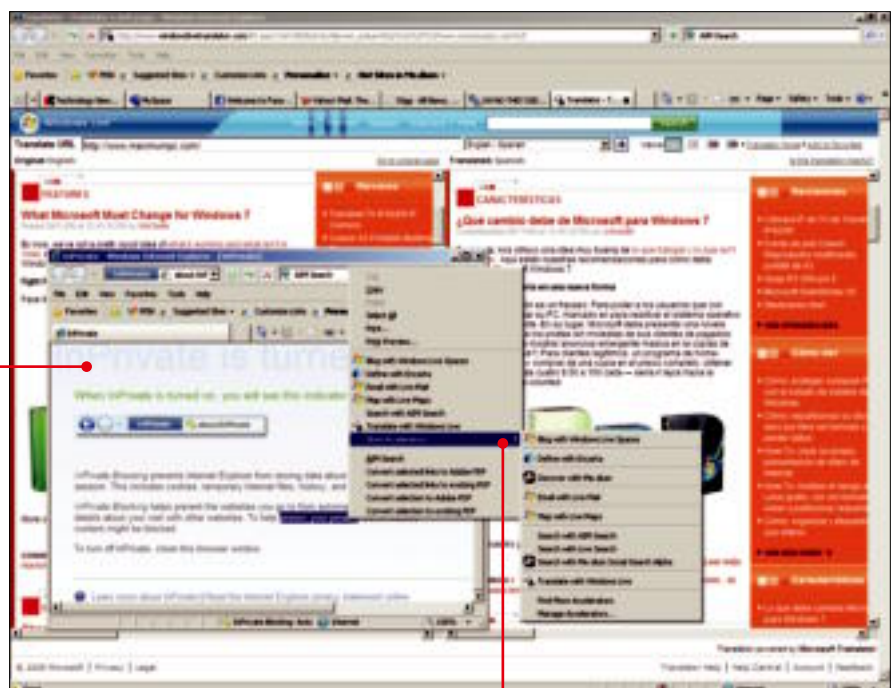
DEATHMATCH

Chrome Beta vs. Internet Explorer 8 Beta

In early September, Google judo tossed the Internet community with the announcement of Chrome, the company's contribution to the browser wars. The minimalist browser was built using WebKit, the open-source rendering engine that fuels Safari and several other OS X applications (surprisingly, Chrome has yet to be released for OS X or Linux). As luck would have it, the timing of Chrome's beta release coincided with the launch of Internet Explorer 8's own public beta, the latest revamp of Microsoft's market-share-dominating browser.

We couldn't turn down the opportunity to pit these two beta browsers against each other, since both tout new privacy features, fast loading times, and advanced browsing aids. It's the fresh-faced browser from an industry darling versus the significantly overhauled browser from a wily veteran. Which one deserves to be your default Internet gateway? —FLORENCE ION

INTERNET EXPLORER 8
Free, www.microsoft.com



ROUND 1

SECURITY

IE8 has InPrivate blocking, a tool that references an online record of which content providers collect private information and will block those providers if they attempt to continue collecting information after you've gone offsite. Users can also customize which content to block or allow. Another welcome IE8 feature is the SmartScreen filter, which warns users of potential phishing sites and malicious cross-site scripts. Google has yet to develop a phishing filter for Chrome, but the browser's Sandboxing feature prevents malware from installing itself on your system or reading files from sensitive areas like My Documents and the desktop.
WINNER: INTERNET EXPLORER 8

ROUND 2

ADD-ON SUPPORT

IE8 is the only contender here with new browser-specific features, including a side-by-side translator, bookmarkable Web Slices (which behave like subscribable feeds), and the Accelerator feature—a right-click menu that offers context-sensitive access to third-party applications (like blogging or maps) based on the word or phrase you have highlighted on a page. Chrome, at least in this beta, is unable to support any third-party add-ons, although we've heard rumblings about the possibility of incorporating Firefox 3-style plugins in the future.
WINNER: INTERNET EXPLORER 8

ROUND 3

INTERFACE

IE8 is certainly inundated with buttons. The enabled-by-default Favorites Bar (called the Links bar in IE7) includes a new Add Favorite button that makes it easier to add bookmarks and bookmark folders. IE8's Home button allows the user to select several different home pages, but the feature seems to be an unnecessary duplicate of the Favorites Bar.

In Windows XP Classic mode, IE8's buttons are almost indecipherable, and it takes a bit of clicking around to figure out each button's purpose. Chrome's interface is uncluttered and spare—even the window borders seem minimalist by comparison—and its top-mounted tab placement is a brilliantly innovative concept. Why didn't anyone think of this before?

WINNER: CHROME

CHROME
Free, www.google.com/chrome

ROUND 4

PERFORMANCE

We tested the speed of both browsers by measuring the load times of 10 popular websites three times each on a freshly booted system. As we expected, Chrome came out on top in this category. Some JavaScript and flash-heavy sites took more than 30 seconds to fully load in IE8, compared to an average of 8 seconds for Chrome. Microsoft's browser also had issues correctly rendering older sites, which necessitated using the new Compatibility View button.

Each tab in Chrome is its own system process, so closing a tab is like shutting down a complete application, freeing the memory that was used. This prevents memory leaks from destabilizing your computer over time, but revisiting previously viewed websites requires a complete reload. Additionally, Chrome has a pretty impressive task manager feature, which lets you know how much memory each website you have open is using. IE8 also keeps tabs on separate processes but had the tendency to slow our test system down after prolonged use, without any indication of how much memory it was using.

WINNER: CHROME

ROUND 5

BROWSING PRIVACY

Microsoft calls it InPrivate browsing while Google calls it Incognito mode, but both browsers have basically the same feature that allows users to surf the web without saving browser and search history, form data, or passwords. This feature is useful if you're on a public terminal or want to hide your potentially embarrassing browsing habits from loved ones. IE8's Delete Browser History function has also been tweaked, allowing you to preserve a bookmarked site's cookies when others are erased, so you don't lose important login information.

WINNER: TIE

And the Winner Is...

Though both contenders put up a good showing, neither has what it takes to dethrone Mozilla's Firefox 3 as our browser of choice. Firefox is still your best bet in the browser market, given its proven stability, solid security, intuitive interface, and generous add-on library that makes net junkies like us ecstatic.

We can't imagine replacing Firefox with either IE8 or Chrome since both of these alternatives are still in their respective beta stages, with plenty of room for improvement. IE8 must still work on memory management and website rendering speed (compatibility being a whole separate issue). Chrome is simple and easy to use but lacks some essential add-ons, like mouse gestures. It may take a while before either of these new browsers reaches maturity, but at least their presence breathes some life into the recently lopsided browser war.

Our consumer advocate investigates...

The Missing Ink Key Conundrum Packaging from Hell

Remix This

I placed an order for ink for my Epson R280 from Inkjetremix.com, feeling assured that I had nothing to worry about, given the company's 30-day guarantee and the "Yahoo Business Merchant Solutions" logo on the site. I was wrong and am embarrassed to be disclosing my problem. I feel an obligation as a *Maximum PC* subscriber to warn others about this company. I purchased $66 of ink and half of it didn't work. I quickly emailed Inkjetremix.com for an RMA as instructed on its website; no email reply was received.

A few days later I sent another email and received no reply. I called the posted phone number. No one answered, so I left a message. A few days later, I left another message. I finally contacted the Better Business Bureau, and they are currently investigating the company. Please notify other readers to beware.

—Alexander Pabon

After receiving Alexander's complaint, the Dog also pinged Inketjetremix.com. You can guess the result: No one bothered to respond. It's not exactly new behavior for the company, either. The Los Angeles chapter of the Better Business Bureau gives the company an F—the lowest possible rating. Only four people have complained about the company, but Inkjetremix.com never responded, so the BBB gave it a big thumbs-down. Given the company's failure to respond to the Dog too, it's fair to say you should avoid this company at all costs. Woof.

Locked out in the Cold

I've paid for and used Outlook Express Backup Wizard for several years now. I like the simplicity of the program, as it will back up to my network-attached storage. I formatted my hard drive, and now the company tells me that my old product key/password is invalid. I've tried to get a response from five separate emails but have had no luck. I can't even get a phone number from the website. At this point, I'm not willing to pay $40 for a new product key since I'm not sure I'll ever get it.

—John

The Dog contacted QSX Software, makers of Outlook Express Backup Wizard, and was told that John is indeed a registered customer, but a spokesperson insists that John has not contacted them. At least, they've never received any questions. "There could be many reasons his emails haven't reached us, most probable is a typo in the email address." The company provided John's serial number, which the Dog forwarded to him. John insists that he did indeed send multiple emails to the company, but then again, his letter to the Dog originally referred to the software as Outlook Exprexx, so typos do happen. The good news is that John got his code. Woof.

The Better Business Bureau gives Inkjetremix.com a solid F for not responding to the org's questions—the company didn't respond to the Dog either.

Keeping You Safe... from the OS

I have a problem with Microsoft's new packaging for Windows Vista. The plastic box is almost impossible to open without breaking it, and you cannot throw it away because the key code is on it. It's the absolute worst packaging out there. Who designs this stuff? Do they do market testing? Thanks for listening.

—Norm

It's perhaps symbolic that people can't even open the Windows Vista box without assistance. The Dog recently had to open a Vista package under a time constraint and was this close to stomping on the sucker when someone with prior experience jumped in to lend help. (There are numerous small arms that can be field stripped in fewer steps!)

As a public service, the Dog will now explain how to open the Windows Vista (and Office 2007) plastic packaging. On the top of the

EMAIL THE WATCHDOG If you feel you've gotten a raw deal and need assistance setting a vendor straight, email the Dog at watchdog@maximumpc.com. Please include a detailed explanation of your problem as well as any correspondence you have sent concerning the issue.

It's actually easier to open the Hellraiser puzzle box than a copy of Microsoft Windows Vista.

box, cut along the grooves on either side of the certificate of authenticity. Next, peel the red tabbed label off the front of the box. Finally, with the Vista logo facing you, grasp the red tab on the top of the box and pull it to the right.

The instructions come directly from Microsoft's own web page dedicated to describing the package-opening process (http://tinyurl.com/3xxh9n). There are even video how-tos on the Internet demonstrating how to open the box, so clearly it *is* actually rocket science.

Perhaps Windows 7 can be packaged inside of a scrambled Rubik's cube. Only after solving it can you access the disc to install the OS.

"IT'S THE ABSOLUTE WORST PACKAGING OUT THERE. WHO DESIGNS THIS STUFF?"

BF Kudos for BFG

People usually complain about companies to you, but I come to praise Caesar, not bury him. The other day I turned on my monitor to find a corrupt image. Immediately, I knew the videocard had gone bad. It was a BFG GeForce 6800 that I bought maybe five years ago.

I went to BFG's website and saw that the card had a lifetime warranty. So I got an RMA and sent the card back. Yesterday, a box showed up from BFG. I opened it up expecting to find my GeForce 6800 card, but instead I found a bright, shiny, new GeForce 7800 card. BFG gave me an upgrade for free!

—Tom Applegate

RECALL ALERT

Sony says some of its 11-inch notebooks may overheat and burn users.

➔ Sony is recalling about 73,000 Vaio TZ-series notebook computers that could pose a burn hazard. The company said wires positioned near the hinge and/or a dislodged screw inside can short out and overheat the computer. Sony said it has received about 15 complaints, with one person suffering a minor burn.

Included in the recall are Vaio VGN-TZ100, VGN-TZ200, VGN-TZ300, and VGN-TZ2000 series notebooks. All are 11.1-inch screen notebooks and were sold between July 2007 and August 2008. The notebooks were manufactured in Japan and the United States. Sony said only a small number are affected, but it did not release serial numbers that consumers could check.

Instead, Sony is encouraging anyone who owns one of the aforementioned models to visit tinyurl.com/usvaiorecall. Canadians can visit tinyurl.com/vaiocarecall.

If you are not near a computer with Internet access, you may also call 888-526-6219. Sony said people who have the models may continue using them, but they should check with the company to see if their product is defective. If you think you have a bad notebook, you should unplug the unit, remove the battery, and contact Sony support.

Sony is offering inspection and repairs of units that are defective. More information is available at tinyurl.com/hotvaios.

2009 Technology Watch List

Our experts handicap

We might be a few years from seeing a radically transformed PCB, but the near future of computing is nonetheless exciting.

ILLUSTRATION BY ADAM BENTON

the hardware that will matter to you most in the year ahead

BY THE MAXIMUM PC STAFF

We know, you just got your rig right where you want it, complete with a primo CPU, a kick-ass videocard config, and seemingly limitless storage. So forgive us if we dangle the temptation of better, faster hardware in front of your face. We're just doing our job. Over the last few weeks, we've been grilling our industry contacts for news of what computing delights await power users in the months and years to come. And delightful the future is: CPUs with eight cores, GPUs that run games as a pastime, mobos with both SLI and CrossFire support, and hard drives so large your data will feel puny and inadequate. And that's just part of it.

Look at it this way: Our 2009 technology preview gives you advance warning about the hardware that will soon occupy your dreams, so you can start saving your pennies and plotting your next upgrade path today.

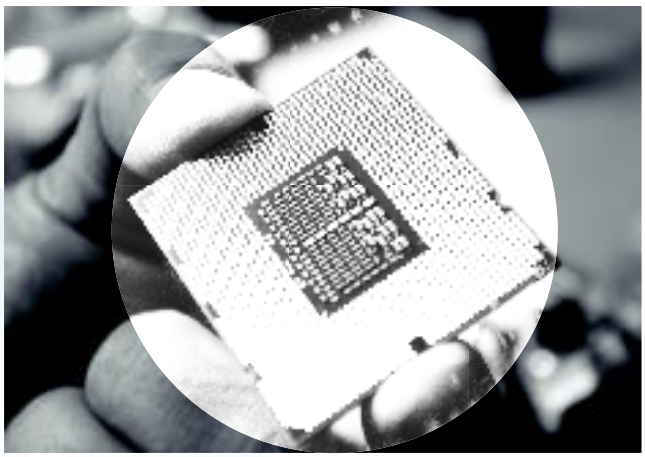
CPUs

Intel takes a bold approach to processor architecture, multi-core computing

As a buttoned-down company, Intel rarely likes to make sweeping changes, but its upcoming Core i7 CPU is a major break from the past. Gone is the ancient front-side bus that connects all of the current-gen CPU cores. Instead, cores will communicate via a high-speed crossbar switch, and different CPUs will communicate via a high-speed interconnect.

Also on the outs is the need for an external memory controller. Intel, which has relied on gluing two dual-core chips together under the heat spreader to make its quad-core CPUs, is now placing all four cores on a single die.

Even overclocking, which was once verboten to even talk about within 10 miles of Intel's HQ, is now *automatically* supported. Intrigued? You should be. Intel's Core i7 is the most radical new design the company has taken in decades.



AN INSIDE JOB

One of Core i7's most significant changes is the inclusion of an integrated memory controller. Instead of memory accesses going from the CPU across a relatively slow front-side bus to the motherboard chipset and finally to the RAM, an IMC will eliminate the need for a front-side bus and external memory controller. The result is dramatically lower latency than was found in the Core 2 and Pentium 4 CPUs.

Why can't the memory controller on the motherboard simply be pushed to higher speeds to match an IMC? Remember, when you're talking about a memory controller residing directly in the core, the signals have to travel mere millimeters across silicon that's running at several gigahertz. With an external design, the signals have to travel out of the CPU to a memory controller in the chipset an inch or so away. It's not just distance, either—the data is traveling across a PCB at far, far slower speeds than it would if it were within the CPU. In essence, it's like having to go from an interstate to an unpaved, bumpy road.

Of course, if you're an AMD loyalist, you're probably bristling at the thought of Intel calling an IMC an innovation. After all, AMD did it first. So doesn't that make AMD the pioneer? We asked Intel the same question. The company's response: One: An IMC isn't an AMD invention and, in fact, Intel had both an IMC and graphics core planned for its never-released Timna CPU years before the Athlon 64. Two: If AMD's IMC design is so great, why does the Core 2 so thoroughly trash it with an external controller design? In short, Intel's message to the AMD fanboys is *nyah, nyah!*

Naturally, you're probably wondering why Intel thinks it needs an IMC now. Intel says the more efficient, faster execution engine of the Core i7 chip benefits from the internal controller more than previous designs. The new design demands boatloads of bandwidth and low latency to keep it from starving as it waits for data.

MEMORY A TROIS

The Core i7 CPU is designed to be a very wide chip capable of executing instructions with far more parallelism than previous designs. But keeping the chip fed requires tons of bandwidth. To achieve that goal, the top-end Core i7 CPUs will feature an integrated tri-channel DDR3 controller. Just as you had to populate both independent channels in a dual-channel motherboard, you'll have to run three sticks of memory to give the chip the most bandwidth possible. This does present some problems for board vendors though, as standard consumer mobos have limited real estate. Most performance boards will feature six memory slots jammed onto the PCB, but some will feature only four. On these four-slot boards, you'll plug in three sticks of RAM and use the fourth only if you absolutely have to, as populating the last slot will actually reduce the band-

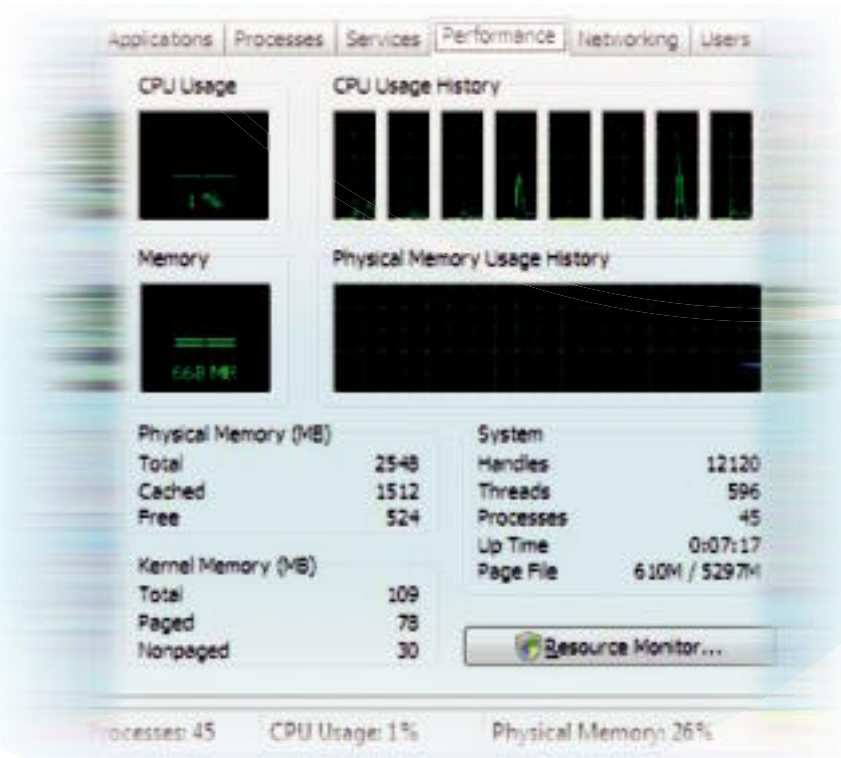
width of the system. Intel, in fact, recommends the fourth slot only for people who need more RAM than bandwidth. With three 2GB DIMMs, though, most enthusiast systems will feature 6GB of RAM as standard.

Although it may change, Core i7 will support DDR3/1066, with higher unofficial speeds supported through overclocking. Folks hoping to reuse DDR2 RAM with Intel's budget chips next year can forget about it. Intel has no plans to support DDR2 with a Core i7 chip at this point, and with DDR3 prices getting far friendlier to the wallet, we don't expect the company to change its mind.

HYPER-THREADING REVISITED

A CPU core can execute only one instruction thread at a time. Since that thread will touch on only some portions of the CPU, resources that are not used sit idle. To address that, Intel introduced consumers to Hyper-Threading with its 3.06GHz Pentium 4 chip. Hyper-Threading, more commonly called simultaneous multi-threading, partitioned the CPU's resources so that multiple threads could be executed simultaneously. In essence, a single-core Pentium 4 appeared as two CPUs to the OS. Because it was actually just one core dividing its resources, you didn't get the same performance boost you would receive from adding a second core, but Hyper-Threading did generally smooth out multitasking, and in applications that were optimized for multi-threading, you would see a modest performance advantage. The problem was that very few applications were coded for Hyper-Threading when it was released and performance could actually be hindered. Hyper-Threading went away with the Core 2 series of CPUs, but Intel has dusted off the concept for the new Core i7 series because the transistor cost is minimal and the performance benefits stand to be far better than what the Pentium 4 could ever achieve.

Intel toyed with the idea of redubbing the feature Hyper-Threading 2 but decided against it, as the essential technology is unchanged. So why should we expect Hyper-Threading to be more successful this go around? Intel says it's due to Core i7's huge advantage over the Pentium 4 in bandwidth, parallelism, cache sizes, and performance. Depending on the application, the company says you can expect from 10 to 30 percent more performance with Hyper-Threading enabled. Still, Intel doesn't force it down your throat because it knows many people still have mixed feelings about the feature. The company recommends that you give it a spin with your apps. If you don't like it, you can just switch it off in the BIOS. Intel's pretty confident, however, that you'll leave it on.



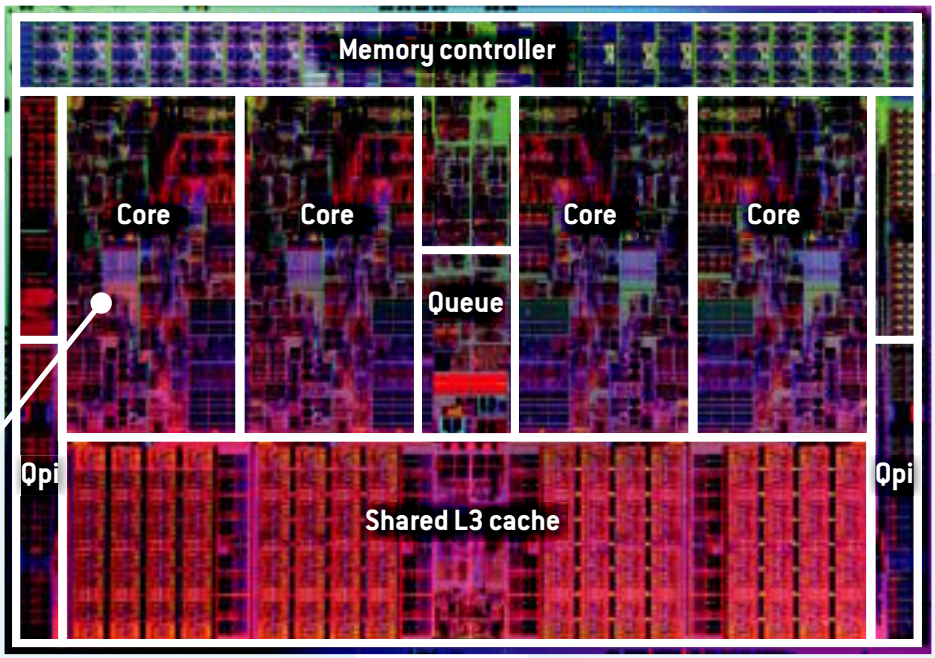
Open up the Task Manager on a quad-core Core i7 machine and you'll see eight cores available.

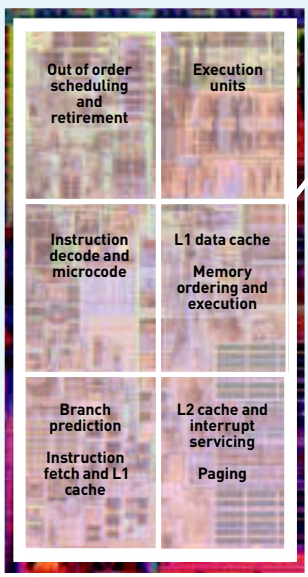
TOMORROW'S PERFORMANCE TODAY

You can't recompile the world. That's the lesson Intel learned with the Pentium 4, which kicked ass with optimized code but ran like a Yugo with legacy apps. And even with Intel's nearly limitless resources, it couldn't get every developer to update software for the P4.

Intel took those lessons to heart with the stellar Core 2 and continues in that vein with Core i7, which is designed to run even existing code faster. That's largely due to the Hyper-Threading, massive bandwidth, and low latency in the new chip, but other touches also help.

Loop conditions are common programming techniques that repeat the same task in a CPU. With Core i7, an improved loop detector routine will save power and boost performance by detecting larger loops and caching what the program asks for. Intel also polished its branch prediction algorithms. Branch predictions are those yes/no questions a CPU faces. If the CPU guesses wrong on what the program wants, the assembly-line-like pipeline inside the CPU must be cleared and the process started anew. New SSE4.2 instructions also make their way into Core i7, but they will be of little benefit to desktop users. Since Intel is designing the





The 45nm-based Core i7 will pack all four cores on a single die. The cores will communicate via a high-speed crossbar switch. An integrated memory controller and Quick Path Interconnect links to other CPUs also make the Core i7 very AMD-like.

chip for server use as well, the new instructions are mainly to help speed up supercomputing and server-oriented workloads.

The main takeaway is that while some of the changes are radical, Intel is being pragmatic with its chip design—you won't have to go out and buy new software to experience the CPU's performance potential.

MAKING BETTER CONNECTIONS

With a Hyper-Threaded quad core, even enthusiasts are unlikely to see the need for a multi-processor machine; nevertheless, one of the new features in Core i7 directly addresses a weakness in Intel's current lineup when it comes to multi-CPU machines. As you know, Intel currently uses a front-side-bus technology to tie its multi-processor machines together. As you might imagine, problems arise when a single front-side bus is sharing two quad-core CPUs. With so many cores churning so much data, the front-side bus can become gridlocked. Intel "fixed" this issue by building chipsets with two front-side buses. But what happens when you have a machine with four or eight CPUs? Since Intel couldn't keep adding front-side buses, it took another page from AMD's playbook by building in direct point-to-point connections over what it calls a Quick Path Interconnect. Server versions of Core i7 feature two QPI connections (desktop versions get just one), which can each talk at about 25GB/s, or double what a 1,600MHz front-side bus can achieve. AMD fans, of course, will point out that the fastest iteration of AMD's chip-to-chip conduit, dubbed HyperTransport 3.1, is twice as fast as the current QPI.

QPI combined with the on-die memory controller will also make an Intel server or workstation a NUMA, or non-uniform memory access, design. Since each CPU has a direct link to its own individual memory DIMM, what happens if CPU 1 needs to access something that's stored in the RAM being controlled by CPU 2? In this case, it must use the QPI link to access the second CPU's memory controller to the RAM to get the data. This will slow things down a bit, but Intel says its tests indicate that even given this scenario, the memory access is still faster than what is possible with the current front-side-bus multiprocessor design.

THE POWER WITHIN

It's a known fact that overclocking can decrease the life of your CPU; thus, Intel has always discouraged end-users from overclocking its CPUs. With Core i7, Intel reverses its stance and actually overclocks the CPU for you! Of course, Intel would not describe its Turbo mode as overclocking, and, technically, it isn't. While pushing your 2.66GHz Core 2 Quad to 3.2GHz would likely strain its thermal and voltage specs, the new Core i7 CPUs feature an internal power control unit that closely monitors the power and thermals of the individual cores.

This wouldn't help by itself, though. Intel designed the Core i7 to be very aggressive in power management. With the previous Core 2, power to the CPU could be lowered only so far before the chip would

crash. That's because while you can cut power to large sections of the execution core, the cache can tolerate only so much decrease in power before blowing up. With Core i7, Intel separates the power circuit, so the cache can be run independently. This lets Intel cut power consumption and thermal output even further than before. Furthermore, while the Core 2 CPUs required that all the cores were idle to reduce voltage, with Core i7, individual cores can be turned off if they're not in use.

Turbo mode exploits the power savings by letting an individual core run at increased frequencies if needed. This again follows Intel's mantra of improving performance on today's applications. Since a majority of today's applications are not threaded to take full advantage of a quad core with Hyper-Threading, Turbo mode's "overclocking" will make these applications run faster. For more information on how you'll set up Turbo mode, read our sidebar below.

NEW SOCKET ON THE BLOCK

So all this CPU goodness and performance will drop right into that $450 LGA775 board you just bought, right? Of course not. Ung's Law dictates that the minute you buy expensive hardware, something better will arrive that makes what you just bought obsolete.

Intel isn't doing this just to piss people off (although a history of such behavior has had that result). Since Core i7 moves the memory controller directly into the CPU, Intel added a load of pins that go directly to the memory modules. The new standard bearer for performance boxes is the LGA1366 socket. It looks functionally similar to the LGA775, with the obvious addition of more pins. More pins also means a bigger socket, which means your fancy heatsink is also likely headed to the recycle bin. LGA1366 boards space the heatsink mounts just a tad bit wider, just enough to make your current heatsink incompatible. There's a chance that some third-party heatsink makers will offer updated mounts to make your current heatsink work, but that's not known yet.

What will be interesting to heatsink aficionados is Intel's encouragement that vendors rate the heatsinks using a unified thermal rating that will be tied to the Turbo mode settings. For more information, see the Turbo mode sidebar below.

THE SECOND COMING

Intel is adopting more than just AMD's integrated memory controller with its new Core i7 chips; it's also adopting AMD's abandoned Socket 940/754 two-socket philosophy. For the high end, the LGA1366 socket will offer tri-channel RAM and a high-performance QPI interface. For mainstream users, Intel will offer a dual-channel DDR3 design built around a new LGA1066 socket late next year. LGA1066 isn't just

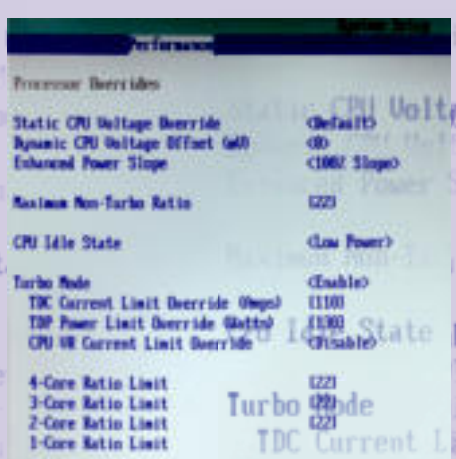
HOW IT WORKS

Intel's Turbo Mode Technology

Turbo mode might sound like a feature left over from the TV series *Knight Rider*, but it's more neat than cheesy. You already know that Core i7 CPUs closely monitor the power and thermals of the chip and use any leftover headroom to overclock the individual cores as needed. But just how does it work?

From what we've surmised by examining an early BIOS, you will be able to set each type of core scenario based on how far you want to overclock, given the load. For example, with applications that push one thread, you could set the BIOS to overclock, or rather, turbo that single core by perhaps three multipliers over stock. You would do the same for two-, three-, and four-core scenarios.

The BIOS will also take into account the thermal rating, or TDP, of the cooling system you're using. If you're using, say, a heatsink rated for 150 TDP, the BIOS will overclock to higher levels than it would with a 130 TDP unit. You would manually set the heatsink's rating in the BIOS, as there's no way for the heatsink to communicate with the motherboard directly.

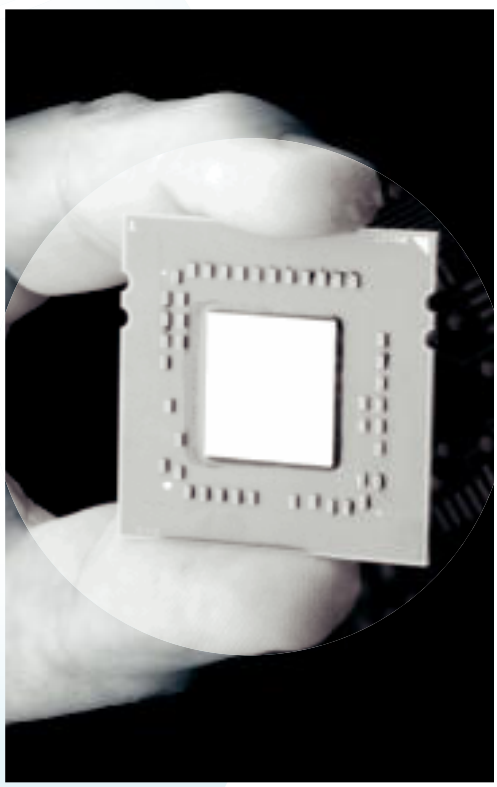


The good news is that you'll get fine-grain control over the Turbo mode in the upcoming Core i7 CPUs.

about shedding one channel of DDR3 though; LGA1066-based CPUs will also bring direct-attach PCI Express to the table.

Instead of PCI Express running through the chipset, as it does with existing Core 2 and the new performance Core i7, PCI-E will reside on the die of LGA1066 CPUs. With the PCI-E in the CPU itself, Intel will reuse its fairly slow DMI interface to connect the CPU to a single-chip south bridge. The two chips Intel will introduce are the quad-core Lynnfield and the dual-core Havendale. Havendale CPUs will actually feature a newly designed graphics core inside the heat spreader that will talk to the CPU core via a high-speed QPI interface. Both chips will feature Hyper-Threading on all cores.

Many AMD users got a royal screwing when the company abandoned both Socket 940 and Socket 754 for a unified Socket 939; could Intel do something similar? We asked Intel point blank whether LGA1366 would eventually be abandoned for LGA1066; the company told us it fully intends to support both platforms.



It's been a long two years for AMD. After a ton of trash-talking, its Phenom CPUs failed to impress anyone. The integrated memory controller, the chip-to-chip interconnects, and the native quad-core design all added up to a high-end CPU that was maybe on par with Intel's slowest quad-core chip. It didn't help that an esoteric bug plagued Phenom's launch and left lingering doubts about the CPU.

Next year will be different, the company pledges.

AMD has long acknowledged that one of its mistakes was trying to make a native quad-core design using a 65nm process. The chips proved to be too big and the yields too low. The yields were initially poor enough that the company began taking defective quad-core dies and selling them as tri cores.

With that in mind, AMD has been feverishly working to get its 45nm process online. The good news is that it's ahead of schedule. AMD says it expects to have 45nm-based CPUs by the end of this year, not well into next year as expected. All indications are that AMD will release 45nm-based Phenoms by late this year with clock speeds finally ramping up to the 3GHz range—a speed Intel pierced more than a year ago.

The bad news is that even a 3GHz die-shrunk Phenom may not be enough to go head-to-head with Intel's Core i7 in performance. For that, it'll likely take the company's Shanghai core, which is on tap for 2009. AMD is playing it much closer to the vest, but the quad-core Shanghai will be followed by a six-core Istanbul CPU at the end of next year. By 2010, AMD expects to have its Magny-Cours chip out with 12 cores in the CPU. Right now, AMD is mainly concentrating on the one bright spot on its roadmap: multi-CPU systems, where its chip-to-chip design makes these configs competitive with Intel's CPUs.

One thing is clear, with rumors continuing to swirl that AMD is short on cash and may sell off its fabs, the company—which has already seen its fair share of adversity—is facing one of its most trying times.

Graphics

Larrabee will loom but not make an impact in '09

It's been a long time since a new vendor entered the 3D graphics market, but that's exactly what Intel plans to do late in 2009 with Larrabee. Unlike previous videocards from Intel, which used traditional 3D pipelines, fairly standard x86 cores will power Larrabee.

Larrabee will include many x86 cores, but the cores in Larrabee processors will be greatly simplified compared to a modern Core 2 proc. Larrabee CPUs will be based on the Pentium P54C design, updated to include modern features, such as 64-bit support and the inclusion of traditional GPU hardware in the form of texture filtering units. Additionally, Larrabee will feature cache coherency between the many x86 cores, which means that all of the cores will have access to the same high-speed cache, and thus, memory. This is a common feature in monolithic CPU cores, like the AMD Phenom and upcoming Intel Core i7, but it isn't typically a GPU feature. Cache coherency should give Larrabee a significant advantage over more traditional architectures when it comes to running general-purpose computing applications on the GPU.

So should you start saving your pennies for a Larrabee-powered GPU in 2009? Not yet. We expect that Larrabee will launch in late '09 with parts targeted at the server community for render farms and scientific applications, followed by mainstream parts designed to upgrade low-end machines that would typically sport integrated graphics. For 2009, at least, Nvidia's GT 200 and ATI's RV770 cores (which power the existing GeForce GTX 280 and Radeon 4870 HD, respectively) will remain the top dogs in graphics.

So what exactly is upcoming from ATI and Nvidia? ATI will roll out a slew of parts across all prices based on modified versions of the RV770. The current rumor is that Nvidia will launch a modified version of the GT 200 sometime next year, tweaked to reduce power consumption and die size, that's more suitable for lower-end parts, as well as dual-GPU cards similar to ATI's Radeon 4870 X2 boards.

IN FOCUS

GPUs for General-Purpose Computing

We've heard a lot of buzz from Nvidia and ATI about GPUs being used for general-purpose computing, but to date, only a small number of applications actually harness this power: a couple of Folding@Home clients, a video encoder or two, and a whole host of scientific and video-rendering apps that don't really apply to normal users. Right now, GPU-based computing is essentially a promising science fair project—at least as far as *Maximum PC* readers are concerned.

In 2009, we expect that to start to change. A host of mainstream apps, including Photoshop CS4, are slated to launch that will impact the scene in a big way. By treating the photos you're editing as 3D textures, Photoshop is able to take advantage of the astounding performance packed into a modern GPU. What's the end-user benefit? Lightning-fast zooms, resizes, and scrolling,

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http://tinyurl.com/4d4omu

and that's just the beginning. And although the first round of video encoders failed to deliver acceptable visual quality at better-than-CPU speeds, we expect to see rapid improvement in visual quality as the GPU-powered encoders mature.

However, we don't expect to see any massive increase in these GPU-accelerated apps until there's a common API that lets software vendors write GPU-accelerated programs for Nvidia, ATI, and Intel GPUs. (Right now, apps must be specifically coded for either ATI or Nvidia GPUs.) Both Microsoft and Apple have APIs in the works that will compete to become the final unified standard, but today there's no way of knowing which will win.

Motherboard Chipsets

Bye bye, north bridge

It used to be that the CPU north bridge was the star of the core-logic chipset world. With its jurisdiction over RAM, the north bridge's speed had a significant impact on performance.

But with AMD and now Intel integrating the memory controller into the CPU, the north bridge's importance just got a whole lot smaller. That's not to say it doesn't still have some use. The north bridge contains the circuitry connecting the motherboard to the graphics cards, and the south bridge as well; in integrated graphics boards, the north bridge also contains a GPU core.

Next year, however, the north bridge's role will be further diminished. AMD is expected to integrate a GPU into the core of its CPUs due next year, and Intel will move graphics and direct-attach PCI-E into the CPU. That pretty much means the end of the north bridge as we've known it all these years.

SLI FOR ALL

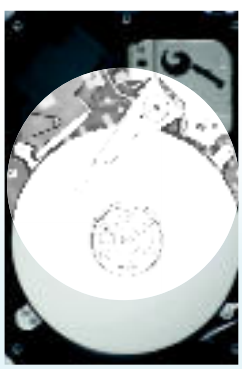
Next year, we'll get something we've long pined for: the ability to run both CrossFire and SLI on a motherboard without the need for extra hardware. The change comes from Nvidia's flip-flop regarding SLI support on motherboards that use Intel's X58 chipset. Originally, Nvidia said it would allow SLI only if motherboard vendors integrated a pricey and hot nForce 200 chip into the PCB to "enable" SLI. When board vendors balked, Nvidia decided to enable SLI on X58 boards the company has "certified" for SLI use. The company says that an nForce 200 chip is still recommended for best performance in configs consisting of more than two cards, but not required.

END OF NFORCE?

With VIA officially calling it quits, Nvidia is the only third-party chipset vendor still shooting live rounds. But what about in 2009? On Intel, it's open for debate. Nvidia has said it believes it has a license to build chipsets for Core i7, but Intel has said that's not quite true. One thing is certain: Nvidia will not have a chipset for the LGA1366-based Core i7 CPU at all, but the company is planning one for LGA1066 CPUs when they're released later next year. Unfortunately, it's not clear whether Nvidia can do this without a lawsuit from Intel—and with graphics and PCI-E integration slated for Intel's LGA1066 CPUs, what would even be the point?

Hard Drives

Perpendicular and patterned-recording technologies will face off



Perpendicular recording has allowed industry giants to push the bounds of drive capacities, with Seagate now leading the pack at 1.5 terabytes. But that trend won't last forever. Hitachi officials believe they can take perpendicular recording all the way up to an areal density of one terabit per square inch—modern drives hover around 300 to 400Gb per square inch. But by 2010, new storage technologies could take hold.

Most promising is patterned media recording. It allows drive makers to overcome the thermal stability issues that plague perpendicular recording. When a manufacturer wants to increase the areal density of a drive, it shrinks the small bits of magnetic material, or grains, on the drive's platter. The smaller these grains get in a perpendicular-recording format, the more likely they are to become thermally unstable—switching their magnetization spontaneously and, thus, scrambling the data they store.

Patterned media recording carves actual grooves onto the platter in the form of tracks or individual bits. The latter can be thought of as a swarm of magnetic islands. Each island stores a single bit of information that's represented by a number of grains magnetized in a particular direction. The size of these grains can be reduced, and the overall areal density of the drive increased, because the magnetic noise from each island of grains is unable to affect others.

Hard drive manufacturers are considering two other storage technologies that would similarly reduce the thermal instabilities between grains. Thermally assisted recording, or heat-assisted magnetic recording, increases the stiffness of the grains to prevent unintended magnetization. The drive head uses a miniscule near-field aperture laser to heat the grains. This allows their magnetization to be switched, representing a change in the data bit. The same goes for the second storage technology: microwave-assisted magnetic recording. Only in this case, the laser is replaced by a small device that can emit a radio frequency magnetic field.

USB 3.0

New spec promises a speed boost

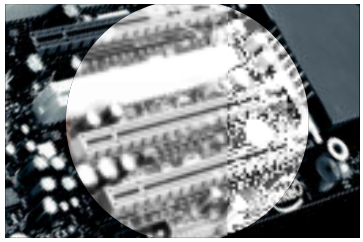
USB 2.0 increased the original data rate of USB from 12Mb/s to 480Mb/s, and now USB 3.0 is set to multiply that bandwidth tenfold. The new 3.0 connectors and cables will be physically and functionally compatible with older hardware—of course, you won't get maximum bandwidth unless you're using a USB 3.0 cable with Superspeed devices and ports.

USB 3.0 will use nine lines; five new lines will sit parallel to the original four lines on a different plane, making it easy to differentiate between USB 2.0 and USB 3.0 cables. Two of the new lanes will transmit data while another pair will receive data; the fifth cable provides an additional ground.

A new interrupt-driven protocol keeps nonactive or idle devices (which aren't being charged by the USB port) from having their power drained by the host controller as it looks for active data traffic. Active devices will send the host a signal to begin data transfer. This feature will also be backward compatible with USB 2.0 certified devices. Hardware partners should have USB 3.0 controllers designed by mid 2009, but consumers won't see products until early 2010.

PCI-E 3.0

Pleasantly predictable



Given the choice between pre-pre-draft specs, a political standards war, or a boring, uneventful rollout, we'll take option C any day. It doesn't get any more boring than PCI Express, which launched and axed AGP almost overnight with very little drama. For the most part, it worked and worked well. The rollout to PCI-E 2.0 went even better than the original's launch.

PCI-E 3.0 is just around the corner, and we're confident in its abilities. PCI-E 1.0 spit out 2.5 gigatransfers a second and PCI-E 2.0 doubled that to 5GT/s. PCI-E goes to just 8GT/s yet actually doubles the data rate by improving the encoding efficiency by 25 percent.

The PCI Special Interest Group said it took this route to save power. The PCI-E 3.0 spec is expected to be fully backward-compatible when it's introduced in 2010. A final spec is expected late next year with testing to take place soon after. If it's anything like PCI-E 1.0 and 2.0, it'll just work.

Yaaaaawn

These once-promising technologies have yet to make an impact

DISPLAYPORT

While numerous sources (us included) have pegged DisplayPort as the next logical progression in PC-to-monitor connectivity, the connection has yet to make a dent in the marketplace. It's a chicken-and-egg story: Monitor manufacturers need to support DisplayPort every bit as much as videocard vendors, and each seems to be waiting for the other to make a big move.

BLU-RAY

OK, the format war is over. Blu-ray is the optical storage king. Still, how many people do you know that have a Blu-ray burner? And of those, how many use it for that purpose regularly? High hardware and media prices, along with perfectly acceptable alternatives, keep this tech firmly planted on the fringe.

10 GIGABIT ETHERNET

10GbE might make Richie Rich happy, but hopes that the superfast interface standard will trickle down to regular-Joe consumers anytime soon seem fanciful. 10GbE over copper is considered to be the poor man's fiber, but it's still a mighty pricey commodity. How pricey? An add-in NIC will set you back more than $1,000, so you can imagine how much a four-port switch will cost you.

UEFI

Universal Extensible Firmware Interface, the ballyhooed replacement for the BIOS, was supposed to have made its big splash this year. Instead, its debut has been more of dribble. Of the mobo vendors, only MSI seems remotely interested in incorporating UEFI—and the boards aren't even out yet. Most others seem to think it's just not worth the time and effort when the current BIOS works just fine.

OLED MONITORS

For years now we've been hearing that organic-light-emitting-diode displays are coming to the desktop, but we've given up on waiting. While the screen technology, which requires no backlight to produce its vibrant colors, can be found in small devices, we just don't see manufacturers ramping up large-scale production at prices that can compete with LCDs anytime soon.

WIMAX

When we first heard of WiMAX back in 2002, we hoped that one day it would empower users with cheap, high-speed wireless broadband. While it's not quite right to call WiMAX a failure—there are hundreds of networks deployed around the world—it's not ubiquitous enough to compete with cellular providers. We fear that by the time it is, the tech will be irrelevant.

802.11N

As we near the end of 2008, we're entering what seems like the second eon of 802.11n development, and unfortunately, there's no end in sight. The involved parties are deadlocked, so it's entirely possible that the draft N 2.0 version is the last update we'll see to 802.11n.

PICTURE PERFECT

Create breathtaking digital images with GIMP—the free, open-source alternative to Photoshop! **BY SCOTT EWART**

Thanks to the wonders of digital photography, even the dullest images can be edited into eye-catching compositions. But if you think that having a digital darkroom means shelling out for expensive creative tools, think again. GIMP, short for GNU Image Manipulation Program (www.gimp.org), is an essential piece of editing software for any photographer—and it's free.

In the following pages, we'll take you on a tour of GIMP. Boost color, straighten those wonky horizons, and master layers (one of Photoshop's main attractions)—we'll show you how to do it all! So dig out your favorite photos and try our GIMP tricks.

Getting to Know GIMP

It takes mere minutes to orient yourself to the application's interface

If you're used to Photoshop, and Windows applications in general, loading GIMP may throw you at first. Rather than a self-contained application window, GIMP starts up with just a minimalist sidebar; it's not until you create a new image or load an existing file that the screen is filled. It may be different, but GIMP is an extremely straightforward piece of software, and the system of separated windows prevents the screen from being cluttered with confusing and unwanted tools and interface features.

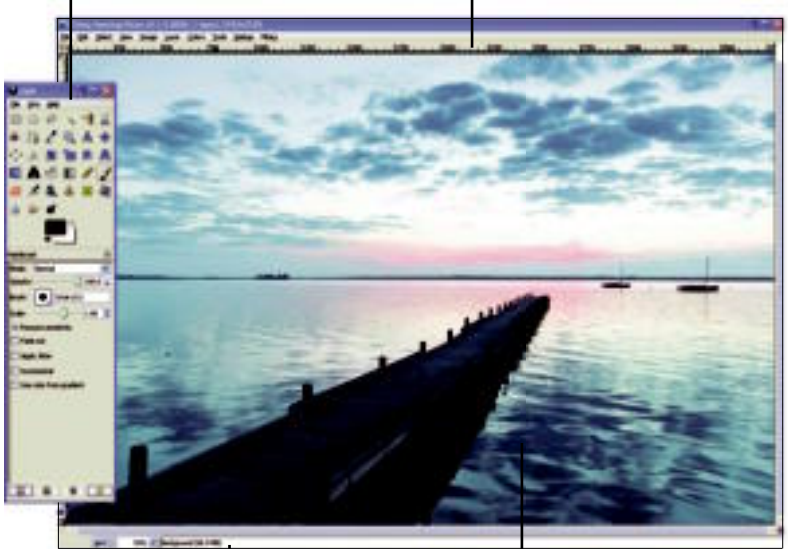
If you're starting the program cold, get a blank image up on the screen by selecting File > New and then choose the desired size/resolution template. The left-hand pane contains a selection of tools—paintbrush, paint can, cropping tool—and controls for their functionality. Options that alter the picture as a whole, such as resizing and color balancing, are controlled from the familiar menu bar across the top of a given canvas.

RGB color mode is the standard format for working with images on a computer screen. Typically, any existing images you're working with will already be created in this mode. To ensure that you have the RGB option selected, go to the Image menu above the canvas and select Mode > RGB.

By now you should have your work area prepared, so you can begin exercising your artistic talents and exploring the more advanced features of this sophisticated image-editing program.

INSTRUMENTAL SECTION
The Tools pane will be a regular port of call as you edit your images.

SENSE OF SCALE
If an image is larger than your monitor's screen, GIMP will intelligently zoom out, but the rulers tell you the true scale.



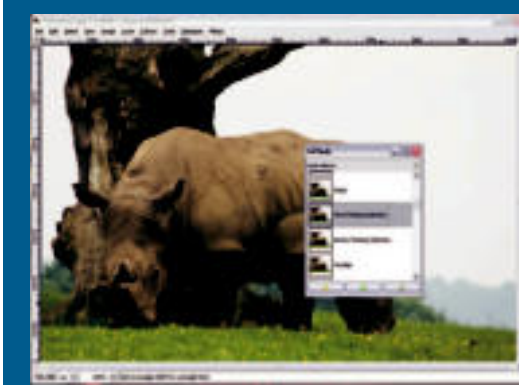
LAY IT ON THICK
This box may not mean much if you're applying changes directly to the image's background, but if you're juggling multiple layers, this indicates which layer you're working on.

MAIN PANE
The main editing window is separate from the others; while dialogs may pop up as you use different tools, they can always be arranged around the work area as you wish.

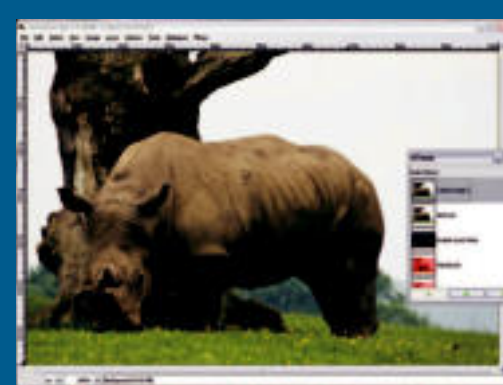
STEP BY STEP

Correcting Mistakes

1. INEVITABLE MISTAKES
When working on an image file, mistakes are, for the most part, unavoidable. Fortunately, unlike more traditional painting, mistakes can simply be scratched from the record.



2. DAMAGE UNDONE
GIMP boasts a more sophisticated Undo system than most apps. Clicking Edit → Undo History brings up a list of every change you have made to an image.



3. BACK IN TIME
You can click an image to bring up a thumbnail list of changes made and double-click on the list to return the image to its prior state.

Selecting and Manipulating

Crop something out of a photo or simply resize it

Not every snapshot comes out perfectly, but with a little editing, improvements can be made without any Hollywood-style retouching. Whether your photograph is spoiled by poor composition or simply by an obnoxious relative making a face, the Select tools are the key to solving most problems. They enable you to isolate areas of the image and remove or modify them. You can make selections in straight lines, using the Rectangle Select tool; elliptical shapes, including circles, using the Ellipse Select tool; or freehand shapes, using the Free Select tool. For more detailed work, the three other tools on the top row of the Tools pane are useful because they enable computer-aided selection of areas, but they are less suited to simple resizing and reshaping.

CROP AWAY
The Crop tool lets you isolate a specific part of a picture: Whatever that selection contains is retained, the rest is discarded.

SMART SCISSORS
This tool enables you to select points along the edge of a shape and then work out the shape you intended to select. Press Enter to create the selection.

HOT TIP

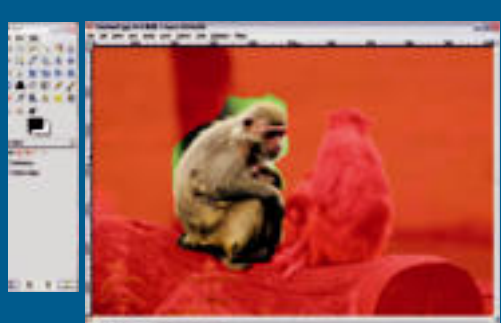
GUIDING LINES If your horizon is askew, pull a guideline down from the ruler that runs across the top of the main screen so it crosses the uneven horizon. Then go to Tools → Transform Tools → Drag and Rotate and drag the slider until it's straight.

INVERTED SELECTIONS Select the area you wish to exclude; then press Ctrl + I, and bingo, you now have everything else selected instead. Invert again to switch back.

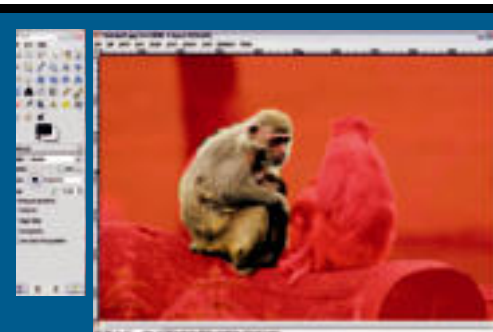
STEP BY STEP

Selecting with Masks

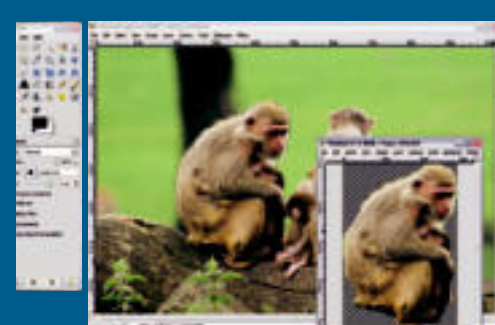
1. SOFT APPROACH Sometimes using the Free Select tool creates too jagged a selection because each pixel is either selected or not. There is, however, an approach that creates a softer boundary for a more realistic look.



2. MASK YOUR INTENTIONS Select the Quick Mask button at the bottom-left of the image (or press Shift + Q). You'll notice that the unselected area is tinted red, whereas the selected area appears in full color.



3. PAINT AWAY In Quick Mask mode, the painting tools—including the paintbrush, pencil, spray paint, and fill bucket—can be used to refine a selection in detail and with soft edges. Choose white paint to select and black paint to deselect.



4. BUSINESS AS USUAL When you switch back from Quick Mask mode, using the same button or key combination, you'll notice that your selection is rendered in the traditional moving dotted lines. You're now free to copy, paste, and manipulate your selection.

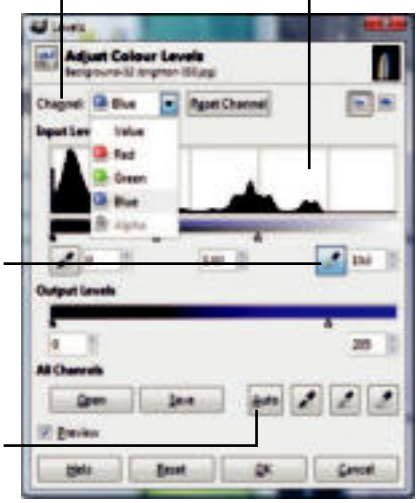
Make Levels Adjustments

Expose a picture's hidden details

Even with cameras that compensate for white balance, lighting conditions, and available color range in a composition, you can still end up with under- or overexposed images or a color cast. In ideal circumstances, you'd correct the problem at the time of shooting, but GIMP's Levels tool lets you do some remedial work on an existing picture. The most useful application of the Levels tool is to correct underexposure, which the walkthrough below demonstrates. It may be possible to reveal more detail without producing a harsh, overly contrasted image. You may also be able to undo a color cast without saturating the image with the contrasting color. The screen to the right shows the main controls available in the Levels dialog.

CHANNEL
This drop-down list lets you select one of the three main color channels to adjust: red, green, or blue. Alternatively, leave it set at Value to change all channels at once.

INPUT LEVELS
The bottom axis represents the color (zero to 255) with the vertical axis showing the frequency at which that tone appears.



WHITE DROPPER
Use this to select an area of an image that should appear white if all channels are selected. If a single color is chosen, use this tool to point at an area of full saturation

AUTO
Click this button to automatically balance the levels in the image or selection. It's the best way to get an acceptable improvement, but the result can look harsh if the tool is used on its own.

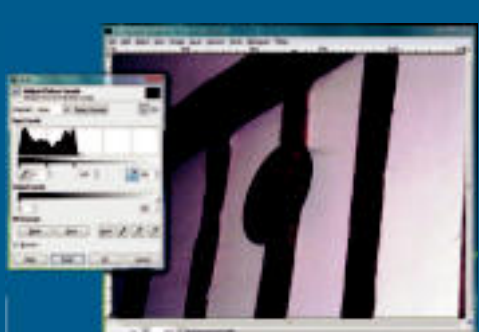
HOT TIP

Just as you can use the white dropper to point to part of the image that should be white, you can also select the black dropper and choose a point that should be black.

STEP BY STEP

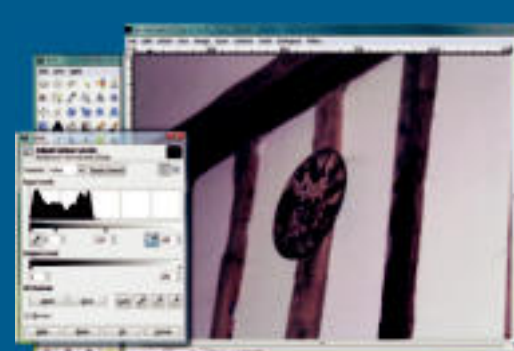
Fix an Underexposed Image

1. OPEN LEVELS Launch GIMP and open the image you want to edit. Choose Colors → Levels to open the Levels dialog. Ensure that the channel is set to Value. This image shows the input levels at the lower end of the spectrum.



2. WHITEN THE IMAGE Click the white Eyedropper tool and point to an area of the image that should be white. Notice that the cursor now resembles a dropper. Click the point that should be white and watch the image lift to match the new white value.

3. REDUCE THE SHADOWS The result can look a little harsh and still hide details. To improve it, we can reduce the shadows. Click and drag the middle arrow on the Input Levels slider to the left. Other details should become more apparent.



4. TWEAK THE LEVELS Finally, we need to deal with the harsh tones that the automatic white balance produced. Move the left-hand arrow on the slider to the right. This should make the whites more natural. When you've finished tweaking levels, click OK.

Edit Hue and Saturation

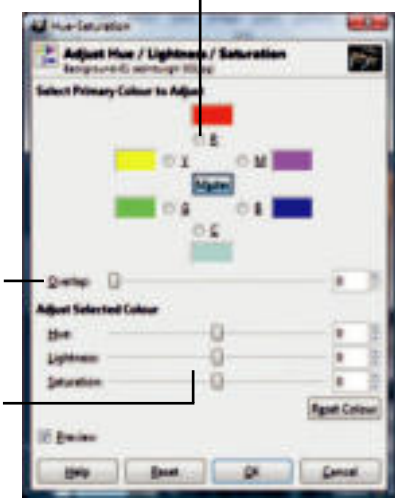
Not all photos reproduce colors faithfully

Occasionally, a color photo doesn't turn out as expected. Colors may look washed out or oversaturated or be tainted by lighting conditions, reflections, or a settings fault with the camera. Sometimes you may want to alter the color in an image for effect, turning a full-color picture into a black and white one, for example. GIMP provides two useful tools for adjusting color: Color Balance and Hue-Saturation. Color Balance lets you alter three color channels, affecting the primary colors of red, blue, and green and balancing each with its complementary secondary color made up of the remaining two channels. Hence, if you reduce red, you effectively boost cyan, made up of the combination of blue and green. Hue-Saturation lets you isolate individual shades in an image and alter the color's intensity. You can remove some or all color with this tool.

HOT TIP

To make an image monochrome, choose Colors → Hue-Saturation and click Master. Now move the Saturation slider to the left, which removes all color from the image.

COLOR SELECT
Pick the radio button next to the primary or secondary color that you'll want to adjust in the image.



OVERLAP
Use this to determine the amount of overlap there will be with the adjacent color range. The effect is subtle and is useful if you want to work with intermediary colors.

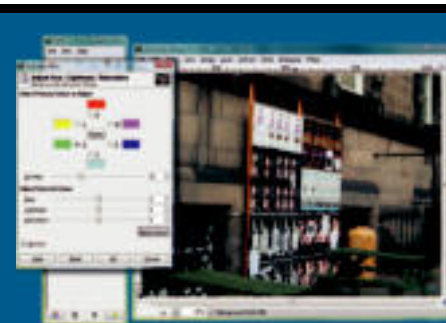
EDIT YOUR COLOR
These sliders enable you to alter hue, lightness, and saturation, so you can change the intensity of a selected color.

STEP BY STEP

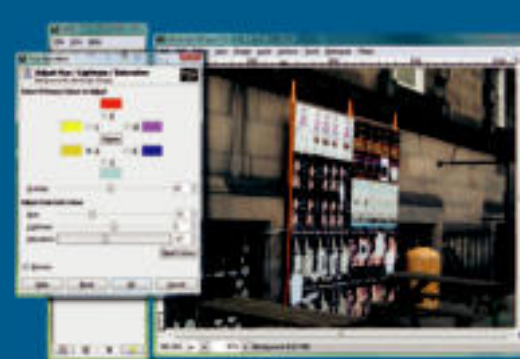
Balance Color

1. OPEN COLOR BALANCE
Launch GIMP and open the image you want to work on. For overall color adjustments, choose Colors → Color Balance. This enables you to change three channels—cyan/red, magenta/green, or yellow/blue—using sliders.

2. OVERALL ADJUSTMENTS
Select Shadows, Midtones, or Highlights and use the sliders to adjust the color levels for each (or enter precise numbers in the fields next to the sliders). Select Preserve luminosity to prevent changing the image's brightness.



3. ADJUST A SPECIFIC RANGE
For greater control, choose Colors → Hue-Saturation. This lets you work with a particular color range. For example, to change the color of the benches, select Green and use the slider to ensure hues close to green are included.



4. KEEP THINGS SUBTLE
Adjust the Hue slider to change the green color to one that's closer to brown—it's best to keep color changes subtle. Reduce the saturation a little to ensure the color blends well with the rest of the image and click OK.

Using Layers and Effects

Give your images a professional touch

Layers and effects go hand in hand. They complement one another and, despite sounding complicated, are easy to master. Layers are the software equivalent of the onion skin paper used by animators in the days before CGI. They enable you to position one image above another, and each layer is entirely independent of all the others. You can move layers around, drag them above and below other layers, and show and hide them at will. This means you can construct complex images from simple parts and, as long as each layer is kept separate, you're always free to change things around. You can alter the opacity, for example, and you can change the way the colors in one layer affect the colors in another. But best of all, you can process the image in one layer with an effect, while all other layers remain untouched.

HOT TIP

To enlarge the thumbnail images in the Layers dialog, go to Edit → Preferences, select the Interface tab from the menu at the right and choose a larger size for the "Default layer & channel preview size."

EFFECTS EQUAL FILTERS

GIMP has some fantastic effects to choose from and refers to them as filters. You can perform wonderful contortions on your image data, ranging from the utilitarian and perfunctory to the creative and abstract. Filters can create texture and fracture, distort, or alter the color of an image. Just select the area of an image you want to change and choose the effect from the Colors or Filters menu.

COLORS

The Colors menu contains the practical effects. The Brightness-Contrast panel, for example, is a worthwhile tool whenever you import a digital photo. Increasing the contrast while decreasing the brightness of a photograph will nearly always improve the image, adding more

LAYER DIALOG
Each layer has its own preview thumbnail, and you can drag-and-drop layers around. Click the Eye symbol to toggle visibility. Increase transparency using Opacity.

LAYER MASKS
A layer can have something called a layer mask channel. This is a separate grayscale image that defines which parts of the layer are visible and which remain opaque.

STEP BY STEP

Make a Shadow

1. CREATE A NEW LAYER
Click the New Layer button on the lower border of the Layers dialog and make sure the Layer Fill Type is set to Transparency. This is because we want our shape to be visible only in this layer to create an accurate shadow.

2. DRAW YOUR SHAPE
Import or draw the shape you want to use to cast a shadow. Text is a special case, as you also need to select "Discard Text Information" from the new text layer's right-click menu.

3. DUPLICATE LAYER
Click the Duplicate Layer button and select the lower copy. Choose Color Balance from the Colors menu. Disable Preserve luminosity and drag the Cyan, Magenta, and Yellow sliders to 100 in each color range.

4. CREATE SHADOW
To create a realistic shadow, use a blur effect. There are several to choose from in the Filters → Blur menu, but we prefer the look of Gaussian. The last step is to use the Move tool to slightly offset the shadow layer.

range between the lighter and darker areas. The Hue-Saturation panel will let you alter the hue of primitive colors within your image—turning green grass to blue, for instance. It's also useful for emphasizing the color of the sky or the intense blue of a swimming pool. For technical alterations, the Curves window adds a fine degree of control over each color channel in an image. It displays an intensity graph for the chosen channel, and you can expand or decrease the levels of intensity by adding points to a curve that stretches across the graph.

As with most other effects, the image updates in real time. Even after you've clicked OK, you can easily reverse the process using Undo. This means you don't need to understand the effects to be able to give them a try, and even trial and error will yield useful results.

LAYERED EFFECTS

Using layers and filters together gets you the best of both worlds. Layers can be quickly duplicated, leaving you free to experiment with a new effect on the new layer without fear of ruining your overall image. A new layer can then be blended into other layers, placed above or below other layers, or even disabled with a single click on the Eye icon. Filters will also work over the edges of a layer, creating a more natural blend than applying the effect to a hard selection. When applying one effect after another to a single layer, you quickly lose track of what it is you've done. Using a new layer for each effect solves this problem and gives you a more flexible solution in the process. But the best thing about all of this is that you don't need any particular skill to give it a go. Just try one effect after another to see what each one does.

EXPERT ADVICE

Using Layer Masks

Despite sounding more like a technology from a 1970s science-fiction film, layer masks are relatively easy to understand. A layer mask is a grayscale image attached to a layer. The darker the areas in the mask, the more of the original image is allowed to show through. It's a special layer that defines how opaque the image is going to be at any point. The best way to understand how to use a layer mask is to try it out. The perfect example is the artificial creation of a false focal point within an image. Load your image into GIMP and duplicate the original layer. Select the new layer and apply the Gaussian effect from the Filters → Blur menu. It needs to be dramatically blurred to the extent you can no longer make out the details in the original image.

Now create a layer mask on this layer by right-clicking it and selecting Add Layer Mask. You'll see its thumbnail image appear to the right of the blurred image. Edit Layer Mask in the right-click menu will also be selected and that means that any editing you do in the main window will draw onto the layer mask. Make sure your foreground and background pen colors are black and white, then select the Blend tool. This creates color gradients, and if you drag a line across the layer mask it'll draw a white-black gradient and, in the process, let some of the original (focused) image through. For best results, try the Radial shape in the Tool Options dialog.

STEP BY STEP

Three Fantastic Effects

1. OLD PHOTO
What would GIMP be if it didn't offer a sepia effect? It can be found in Filters → Decor and uses blur and a mottled surface effect, as well as sepia tones, to create that "just found in the attic" effect.

2. IWARP
There are many distortion effects to choose from and they can all be found in Filters → Distorts, but our favorite is the iWarp effect. This enables you to drag a magic cursor across the preview panel to suck and grow bits of your image!

3. LIGHTING
The lens flare effect may have become something of a cliché, but there are other light effects that still look good. The Lighting Effects filter bundles the best of them by letting you add up to six different light sources into your scene.

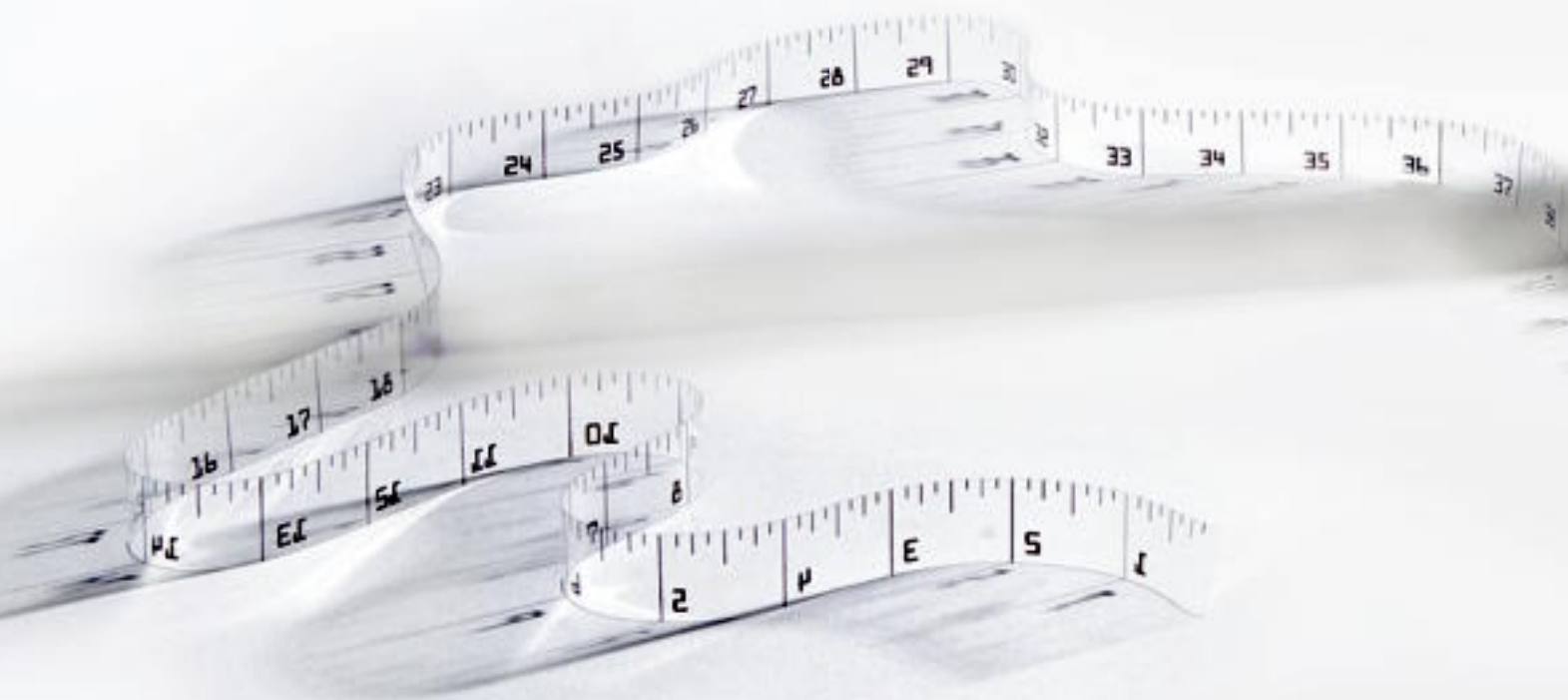
LITTLE PACKAGES,

A burgeoning breed of supersmall, superportable PCs is upon us. We get hands-on with three of these so-called netbooks to see if they measure up to the hype **BY NATHAN EDWARDS**

A few years ago, SUVs were riding high, with throngs of the massive gas-guzzlers clogging the highways. Compact cars were considered wimpy and passé. Fast-forward to the present day and suddenly small is back in style. It's not the size that matters, as the saying goes, it's what you do with it. Since the advent of Asus's Eee PC, manufacturers have been racing to bring tiny, low-powered laptops, also known as netbooks, to the market. You probably won't use a netbook as your primary computer: limited storage space, integrated graphics, and the lack of an optical drive make them unsuitable for any really intensive tasks. But as small, eminently portable word-processing and Internet-browsing devices, netbooks hit the price/performance sweet spot for many people. By the end of 2008, more than 8 million netbooks will have been shipped.

In just the past several months, the netbook market has gone from nonexistent to immense, with dozens of models out already, most of them built around Intel's low-voltage Atom processor, but some on VIA's C7-M.

For this roundup, we chose three Atom-based netbooks running XP from three different vendors at three different price points to determine what this new category of portable PCs is capable of and how much price figures into performance. Ultimately, we aim to answer whether this new breed of portable PC is something we should even care about.



BIG PROMISES

Putting Netbooks to the Test

Unique devices deserve unique benchmarks

Simply put, our standard benchmark suite won't run on these netbooks—installing Photoshop alone took more than an hour, and the results were noteworthy only for their excruciating slowness. So we asked ourselves, "What *would* we use a netbook for?" Web browsing—clearly they'll all do that. Word processing? More than capable. Playing movies? Granted, there's no optical drive but that can be worked around. Gaming? We'd never expect one of these machines to run a graphics powerhouse like Crysis, but we'd like to believe there's some level of gaming to be played.

Here's how we went about testing the wee machines.

PHOTOSHOP CS3

We kept our standard benchmark suite's Photoshop script as an easy point of comparison between the netbooks we're testing here and the beefier processing power of our more usual fare.

DVD BATTERY RUNDOWN

As we do with all notebooks, we tested the battery life of these netbooks by playing a video continuously until each machine ran out of juice. Since each netbook shipped with a different DVD media player (and no optical drive), we leveled the playing field by installing a player that none of them shipped with: CyberLink Power DVD 8. Normally, we'd use a 7.17GB DVD rip of *Magnolia* for this purpose. Trouble was, the Asus Eee 901's 12GB of storage, which is divided between a 4GB and 8GB drive, didn't supply sufficient space for the file. So we grabbed an episode of *The Rockford Files* (a 1GB, 46-minute-long variable-rate VOB file) and played it on repeat on each machine, at 50 percent screen brightness and 50 percent volume, until the batteries gave out. And now we hate that episode.

Note: We reviewed all netbooks as shipped. This means the MSI Wind and Acer Aspire One shipped with three-cell batteries, as is standard, while the Eee shipped with a six-cell battery.

QUAKE LIVE

So as not to set the gaming bar too high, we turned to Quake Live, a still-in-beta, free web-based version of Quake III, which came out nine years ago.

H.264 PLAYBACK

H.264 is a popular video codec, but it requires a decent bit of power to render. We used a 1.92GB MPEG-4 of *Return of the King*, played from the desktop, and looked for any sort of stuttering, skipping, or hesitations.

Asus Eee PC 901

A machine that looks better on paper

Asus's Eee PC kick-started the netbook craze and remains the brand most associated with the category. Early iterations were praised for their low-cost Linux-based architecture, but lately Asus has ratcheted up its product line to compete with higher-end netbooks, like the HP Mini-Note 2133 (http://tinyurl.com/5lu4un). The 901 runs on Intel's Atom architecture at 1.6GHz and has 1GB of DDR2 RAM clocked at 533MHz.

Both versions of the 901 come with two SSD drives, but the Linux SKU ships with 20GB of total hard disk space, while the Windows model has just 12GB. Presumably Asus wants to save the folks springing for Windows some money, but we have a better way: Use real hard drives. SSDs read fast, but the cost per gigabyte is high, and their write speeds leave much to be desired. Indeed, the 901 took more than twice as long to complete our Photoshop benchmark as the other two netbooks here. On the other hand, the 901's standard six-cell battery far outstripped the competition's three-cells, eking out more than five and a half hours in our video-rundown test—the other netbooks lasted barely two hours.

The 901 is extremely well built, an thick barrel hinge makes the screen st Its trackpad is multi-touch and quite c fortable, though we found its sensitivi high. The keyboard, however, is too sn and cramped—our normally nimble fi kept missing the mark.

The Eee PC hits a lot of our buttons—we love its battery life and sturdy construction. But we hate its miniscule storage capacity, cramped keyboard, and frighteningly slow benc results. You won't want to run Photosh any of these netbooks, but the fact that the 901 took twice as long with this benchmark as two less-expensive models is worrying.

If you love long battery life and have dainty hands, this is the machine for you.

BENCHMARKS	
PHOTOSHOP (SEC)	1,530
H.264	YES
QUAKE LIVE	WNR
BATTERY LIFE (HRS:MIN)	5:30

VERDICT 6

ASUS EEE 901
$600, http://eeepc.asus.com/global

SPECIFICATIONS	
DISPLAY	8.9" LCD @ 1024x600
PROCESSOR	Intel Atom N270 1.6GHz, Socket 437
RAM	1GB DDR2/533
STORAGE	4GB SSD (OS volume), 8GB SSD
PORTS	3 USB, VGA-out, audio in/out, SD reader
WIRELESS	Bluetooth, 802.11b/g
LAP/CARRY WEIGHT	2 lbs, 8 oz/2 lbs, 15 oz

MSI Wind U100

The bigger they are, the... more comfortable they are to type on

MSI has been moving into the notebook market in a big way over the past few years, with forays into business and gaming notebooks, and, this summer, netbooks, with the Wind U100. We have to say, we're impressed.

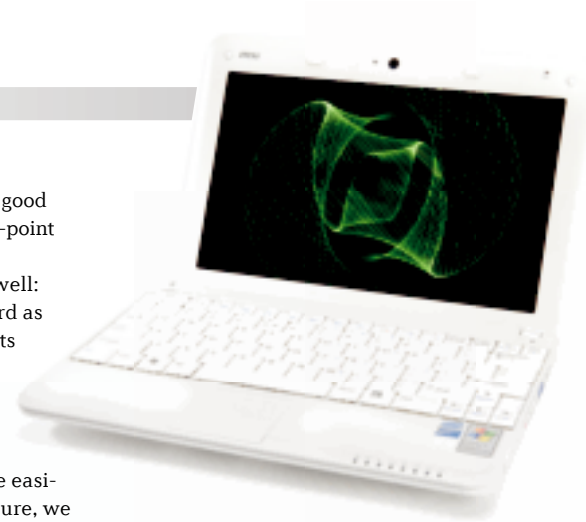
The MSI Wind runs on the same Intel Atom N270 processor and Intel GMA950 integrated graphics chipset as the other two netbooks in our roundup. Unlike those two, however, the Wind sports a 10.1-inch LED-backlit LCD display, making it the largest netbook we've tested, although that's nearly an oxymoron.

The corner hinges on the Wind are not quite as sturdy as the Eee PC's barrel hinge or the Aspire One's, but it's still solid. The matte screen is quite bright under AC power and readable at even 25 percent backlighting.

The Wind performed admirably in our tests (with the exception of Quake Live), lasting nearly two hours in our video battery-rundown test. It plowed through our Photoshop benchmark in 730 seconds, twice as fast as the Eee 901—albeit a good third the speed of our Asus C90S zero-point notebook.

The Wind's larger size serves it well: Though it has the same-size keyboard as Acer's Aspire One (reviewed next), its wider body means that large hands don't hang quite as far off the board.

Add to that the slightly larger screen, and the Wind emerges as the easiest to use netbook in our roundup. Sure, we like the Eee's fantastic battery life, and the Acer's bigger hard drive, but drop another $50 on a six-cell battery and you've got five hours of battery life and a form factor that's comfortable enough to use for those five hours.



We love nearly everything about this machine, except its price.

BENCHMARKS

PHOTOSHOP (SEC)	730
H.264	YES
QUAKE LIVE	WNR
BATTERY LIFE (HRS:MIN)	1:57

MSI WIND U100
$500, www.msimobile.com

VERDICT **7**

SPECIFICATIONS

DISPLAY	10.1" LCD @1024x600
PROCESSOR	Intel Atom N270 1.6GHz, Socket 437
RAM	1GB DDR2/533
STORAGE	80GB HDD
PORTS	3 USB, VGA-out, audio in/out, SD reader
WIRELESS	Bluetooth, 802.11b/g
LAP/CARRY WEIGHT	2lbs, 9oz/3lbs, 4oz

OS ALTERNATIVE

Is Windows Necessary?

All the netbooks we tested run Windows XP, but they all have siblings that run Linux. The first netbooks shipped with Linux only, but as the category grew in popularity, so too did demand for a more familiar operating system. Vista is too resource-intensive (although some netbooks, like the MSI Wind, offer it as an option), but XP is stable and was built to run on this caliber of hardware.

But is XP the best operating system for a netbook? Most common netbook tasks—browsing, document editing, playing media, even using VoIP—aren't Windows-exclusive. There are Linux apps that do all of these things, and netbook manufacturers include them with the customized Linux distros loaded onto their machines. We rely on Windows to run certain applications that don't necessarily have Linux equivalents: games, media-creation software like Adobe Creative Suite 3, and so forth. But will you really be using these types of apps on a netbook?

Netbook manufacturers have taken pains to make using Linux more intuitive—Acer and Asus have custom Linux front-ends with easy access to OpenOffice, Firefox, the Evolution mail client, Pidgin, and telephony and media-player applications.

We can't think of anything we use a netbook for that we couldn't do with Linux. And if it shaves 50 or 100 bucks off the price of the machine, why not go with the open-source OS? It might just be your first step into the larger world of Linux.

Acer Aspire One

This little machine aspires to greatness, and almost achieves it

In many ways, the Acer Aspire One is like the little sibling of MSI's Wind. Besides sporting the same Intel Atom N270 processor running at 1.6GHz, 1GB of RAM, and Intel GMA 950 integrated graphics, the two netbooks share a similar look and feel.

The difference is that the Acer has a slightly smaller form factor and an 8.9-inch screen, while the Wind's screen is 10.1 inches.

In our benchmarks, the similarities continued: The Aspire One performed nearly identically to the Wind in almost all of our tests, chugging through the Photoshop script in just 729 seconds, a second faster than the Wind. It also lasted a few minutes longer in the battery drain test—not surprising, given its smaller screen.

The One's keyboard is the same size as the Wind's, but thankfully it doesn't employ the latter's irritating reversal of the Ctrl and Function keys.

The touchpad feels like it's covered with the same paint as the rest of the machine, which meant we couldn't tell just by touch whether our fingers were on it. Acer also decided to put the mouse buttons on either side of the touchpad instead of below it, which makes pointing and clicking awkward.

One big advantage the Aspire One has over the Wind is its 120GB hard drive, which is 50 percent larger than the MSI machine's drive. Also, the screen is glossy, while the Wind's is matte. The choice between reflective and matte is largely a personal one, but we prefer the lesser of the two glares.

In a fair fight against the Asus Eee PC 901, the One clearly emerges as the victor. And, though it has flaws that the MSI Wind doesn't share, the One has a significant advantage over even that model: It's $150 cheaper, despite its much larger hard drive. In our opinion, that $150 buys it a bit of slack.

The placement of the trackpad buttons confuses and frightens us.

BENCHMARKS

PHOTOSHOP (SEC)	729
H.264	YES
QUAKE LIVE	WNR
BATTERY LIFE (HRS:MIN)	2:00

VERDICT **8**

ACER ASPIRE ONE
$350, www.acer.com

SPECIFICATIONS

DISPLAY	8.9" LCD @ 1024x600
PROCESSOR	Intel Atom N270 1.6GHz, Socket 437
RAM	1GB DDR2/533
STORAGE	120GB HDD
PORTS	3 USB, VGA-out, audio in/out, SD reader, multicard media reader
WIRELESS	Bluetooth, 802.11b/g
LAP/CARRY WEIGHT	2lbs, 5oz/3lbs

To Netbook or Not?

A great second computer, a pathetic first one

LEARN MORE AT MAXIMUMPC.com
http://www.tinyurl/634kks

In the end, we were impressed by all three contestants in this roundup; all felt zippier and more capable than we initially expected, though our expectations were pretty low. We didn't expect these machines to be able to run Photoshop at any speed, for example, and several editors were surprised to see them play H.264 video seamlessly. We were a little disheartened that none of the netbooks would play Quake Live, but there is still gaming to be had—you can load up old 800x600-resolution 2D games like Starcraft and Fallout 2 to take on the road, given an external optical drive for the initial installation.

The title bout in this roundup is between the Acer Aspire One and the MSI Wind U100. Sorry, Eee, we loved your battery life, but between your miniscule storage, cramped keyboard, absurdly slow Photoshop score, and the fact that you're $600, you're not winning this match. So that choice is relatively easy.

What's harder, though, is choosing between two very good netbooks for the top prize. Both machines have near-identical specs and benchmark scores, which is nice but makes the choice between the two more difficult.

We really liked the MSI Wind—it was the most comfortable machine to use, and we appreciated its slightly larger screen size and its matte LCD finish. We preferred its touchpad to the Acer Aspire One's, which has its buttons on either side, not at the bottom like God intended. But the fact remains that its hard drive is only 80GB, compared to the Aspire's 120GB, and the Aspire slightly outperforms the MSI in every benchmark. Oh, and the Aspire's $150 cheaper. We're just not sure that that slight additional level of comfort is worth the extra cash. Even if it is, USB mice are cheap; you can bypass the Aspire's touchpad entirely and still have enough money to augment the machine with a six-cell battery or two.

So we're torn. You're probably not going to use a netbook as your primary heavy-lifting machine—the sparse screen real estate, integrated graphics, lack of an optical drive, and limited processor and RAM speeds ensure that. But if you need a small, easy-to-use, and decently fast machine to take on the road, a netbook is a good bet—a mainstream notebook at the same cost will get you better performance, but at the price of portability.

Regardless of which you prefer—the Aspire One or the MSI Wind—you'll want to throw down for a six-cell battery. Otherwise, with just two hours of battery life, what's the point?

WHITE PAPER

Virtual Machines

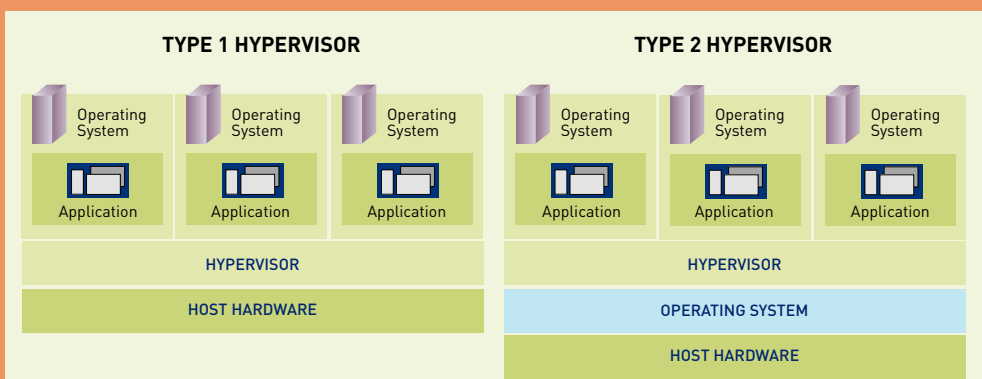
This software technology can make one computer do the work of several —MICHAEL BROWN

Can a computer exist without hardware? It can if it's a virtual machine. A virtual machine is software that's capable of executing programs as if it were a physical machine—it's a computer within a computer. Virtual machines can be divided into two broad categories: process virtual machines and system virtual machines.

A process virtual machine is limited to running a single program. A system virtual machine, on the other hand, enables one computer to behave like two or more computers by sharing the host hardware's resources. A system virtual machine consists entirely of software, but an operating system and the applications running on that OS see a CPU, memory, storage, a network interface card, and all the other components that would exist in a physical computer. For the remainder of this discussion, we'll use the term "virtual machine" to refer to a system virtual machine.

HOW IT WORKS

Two Types of Virtual Machines



System virtual machines fall into two categories: Type 1 hypervisors (left), which run directly on the host hardware, and Type 2 hypervisors (right), which run on top of another operating system. Both are capable of running multiple independent instances of one operating system or different operating systems, all of which behave as though they are solely in control of the system.

Software running on a virtual machine is limited to the resources and abstract hardware that the virtual machine provides. Since a virtual machine can provide a complete instruction set architecture (ISA, a definition of all the data types, registers, address modes, external input/output, and other programming elements that a given collection of hardware is capable of working with), a virtual machine can simulate hardware that might not even exist in the physical world.

IBM DEVELOPED VIRTUAL MACHINE TECHNOLOGY FOR ITS BIG-IRON MAINFRAME COMPUTERS IN 1967....

Using virtual machines, a computer can run several iterations of an operating system—or even several different operating systems—with each OS isolated from and oblivious to the existence of the others. The only requirement is that each operating system must be capable of supporting the underlying hardware. And, of course, there must be enough resources (memory, hard disk space, CPU cycles, and so on) to support everything. You could use a virtual machine to run Linux on top of Windows, for instance, or you could run two versions of Windows and use one as a sandbox for testing software you wouldn't trust on a "real" machine.

MORE POWERFUL THAN A SUPERVISOR

The software that manages this trick is known as a hypervisor. A Type 1 (native) hypervisor is a program that runs directly on the host hardware, i.e., as an operating system in and of itself. Microsoft's Hyper-V, formerly known as Windows Server Virtualization, is one example of a Type 1 hypervisor. A Type 2 (hosted) hypervisor, such as Microsoft's Virtual PC 2007, runs on top of another operating system.

IBM developed the technology for its big-iron mainframe computers in 1967, but the Intel x86 architecture at the foundation of IBM PC-compatible machines was not well suited for running hypervisors. Achieving full virtualization required exceedingly complex code, which hampered runtime performance. Although it remained a fixture in mainframe and midrange computer systems, virtual machine technology saw very little progress during the 1980s and 1990s.

In the last few years, however, AMD and Intel both developed extensions to their x86 architectures that render newer CPUs much more suitable for running hypervisors. AMD has dubbed its extensions AMD Virtualization (AMD-V); Intel calls its extensions Intel Virtualization Technology (Intel VT). AMD-V is present in many newer AMD CPUs, including the Athlon 64 and Athlon 64 X2 (socket AM2 only), the Phenom X3 and X4, and second-generation Opteron server parts.

You'll find Intel VT in about half of Intel's Core 2 Duo desktop processors (the E6600 through E6850, and the E8200 through E8600), all of its Core 2 Quad and Core 2 Extreme desktop processors, and its quad-core Xeon and Itanium server procs (the Itanium version is formally known as Virtualization Technology for IA-64). Intel's upcoming Core CPU will feature Intel's VT-d (Virtualization Technology for Directed I/O), which will enable guest virtual machines to directly use peripheral devices, such as a network interface device. Although AMD-V and Intel VT are similar, they're not compatible—a hypervisor that supports only AMD-V will not take advantage of the virtualization extensions in an Intel CPU and vice versa. Fortunately, hypervisors that support both sets of extensions are common.

APPLICATIONS FOR VIRTUAL MACHINES

What are virtual machines good for? The most common application today is server deployment. A virtual machine can make much more efficient use of a server's hardware by running several instances of the same operating system and the same applications in parallel, or even different operating systems and applications.

In either scenario, each instance thinks it has sole access to the hardware and behaves accordingly. The hypervisor dynamically assigns virtual resources (such as processors and memory) to physical resources so that the hardware is never left idle. Virtual machines are also useful as test platforms: System designers and application developers can experiment with new code without disrupting or interfering with the usual production environment.

But virtual machines are useful for individual users, too. Experimenting with different operating systems—such as Linux—on one computer is just one example. Trying out new software—especially shareware—is another. If a program renders your system unstable, you can blow away the virtual machine without any consequences. Or if you're paranoid about privacy, you could create a virtual machine explicitly for web browsing: Isolate all your personal information on one installation that you never use for web surfing. Fire up the virtual machine when you *do* want to browse the web and tracking cookies, spyware, and any other Internet detritus you encounter will be trapped there, where it can't harm your production environment.

Getting started with virtual machines is certainly cheap enough: Several programs are available for free, including Microsoft's Virtual PC and Sun Microsystems's VirtualBox (the latter of which is capable of running Windows as a guest operating system running on Linux).

Belkin Vision N1 Router

One of the features we like about Belkin's Vision N1 router is the large LCD that keeps you informed of your network's status. Let's see what goodies are inside.

LCD One of the Vision N1's key selling points is this large display that keeps you informed of your network's status and your connection to the Internet.
CPU The Atheros AR7141 is the router's CPU. This one is a 32-bit model clocked at 400MHz. It drives the display, serves as the interface to memory, and handles communication over the internal PCI bus and the USB 2.0 bus, among other things.
WIRELESS MAC/BASEBAND CHIP The Atheros AR5416 is a baseband and Media Access Controller (MAC) chip. This provides the router with the addressing and channel access control mechanisms needed for a device to transmit on and share the network's capacity.
FLIPSIDE
GIGABIT ETHERNET SWITCH The Vitesse VSC7385 serves as the Vision N1's integrated gigabit switch. This is one of only two components (the other being the transistor that is part of the router's power circuit) that requires a heatsink for additional cooling.
WAN PORT This Ethernet port connects the router to your Internet gateway (i.e., your DSL or cable modem). WAN is an acronym for Wide Area Network.
ETHERNET PORTS These Ethernet ports are connected to the router's gigabit switch, which enables multiple devices to share access to your Internet gateway.

SUBMIT YOUR IDEA Ever wonder what the inside of a power supply looks like? Don't take a chance on destroying your own rig; instead, let us do the dirty work. Tell us what we should crack open for a future autopsy by writing to comments@maximumpc.com.

HOW TO

Troubleshoot and Optimize Your Internet Experience

Who needs tech support? Diagnose and resuscitate your ailing broadband connection like a seasoned pro! —CHRIS COMISKEY

TIME = 97 MINUTES

WHAT YOU NEED

- **AN INTERNET CONNECTION**
- **WINDOWS XP OR WINDOWS VISTA**
- **SPYBOT SEARCH AND DESTROY**
  Free, http://tinyurl.com/5or9tg
- **AD-AWARE SE free edition**
  Free, http://tinyurl.com/6lzwnk

With outsourced support now the de facto standard in the IT and ISP industries, do-it-yourself computer repair has gone from being an optional luxury to an outright necessity. You might feel hopeless and abandoned the first time your network connection gives out, but don't fret just yet. Given the right direction, even the greenest of users can fix a number of common network errors. We're going to give you all the tools you need to become your own network tech support.

You might be skeptical, but LAN/WAN troubleshooting isn't all that difficult. Upgrades are easy and cheap—if required at all—and the analysis process is brief and painless, even if you've never wired a Cat5 cable or run a command line ipconfig. Even better, many of the steps and instructions are identical in Vista and XP, which goes a long way toward easing the troubleshooting transition, should you switch from one OS to the other.

While sometimes a call to your ISP is unavoidable, when you do have to do it, at least you'll brandish the knowledge to blaze through all the low-level BS and head straight to a speedy resolution. Don't let the Internet and networking companies bully you any longer—it's time to stand up and take matters into your own hands.

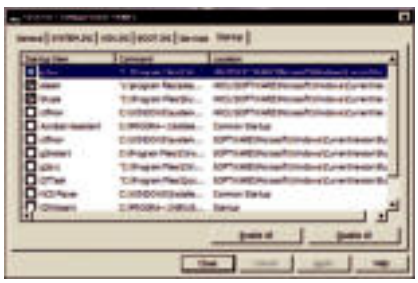
SUBMIT YOUR IDEA Have a great idea for a How To project? Tell us about it by writing to comments@maximumpc.com.

FIND THE ROOT OF THE PROBLEM

1 Some of the jargon you get from tech support is actually worthwhile. First, if your network connection is on the fritz and you're connecting through a personal router, remove the router and connect your PC directly to your ISP's point of entry (e.g., the cable modem). Reboot your modem immediately and then restart your computer. Next, examine your network cables. Is your Ethernet cord crimped or does it have a loose RJ45 retention clip? Replace it. The smallest things can often disturb your connection, and it's always best to err on the side of caution.

Next, open a command prompt by going to Run in XP's Start menu or the search bar in Vista's Start menu and typing `cmd` and hitting Enter. Type `ipconfig` and hit Enter. Ensure you're receiving a proper IP address, subnet mask, and default gateway. If any entry is empty, type `ipconfig /release` and hit Enter; then type `ipconfig /renew` and press Enter. Now try to ping the default gateway by typing `ping xxx.xxx.xxx.xxx` (where the x's are the numbers in the gateway) and pressing Enter. Note the results. If you can ping your gateway, see if you can resolve a domain name by typing `ping google.com` and pressing Enter.

Next, test the stability of your connection for 15 minutes by running a continuous ping. At the command prompt, input `ping -t google.com` and press Enter. After the time is up, hit Ctrl + C to stop the ping. Scan the list and observe any timeouts (a couple is OK, but more than that is trouble). If you still can't browse, or if you've encountered an error during any of the commands, refer to Step 3 for a solution.



DIAGNOSE THE CAUSE OF SLOW INTERNET CONNECTIONS

2 Running a home network with two or more dormant computers? Turn off those machines or put them in standby—any additional rigs downloading or uploading information (no matter how minute) will negatively impact your online performance. Therefore, if you want maximum bandwidth, lock out those YouTube-surfing in-laws during your sweet all-night-long TF2 sessions.

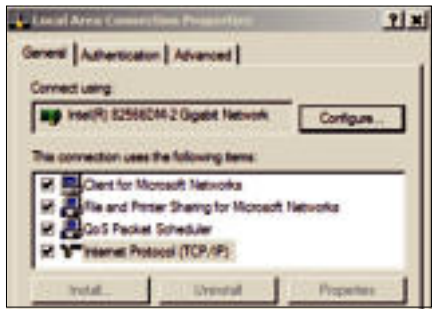
Also, as clichéd as it might sound, the most common causes of a bogged-down connection are spyware and malware. If you haven't done so already, download and install both Ad-Aware SE free edition (http://tinyurl.com/6lzwnk) and Spybot Search and Destroy (http://tinyurl.com/2c4c69); run them one after the other (you can safely ignore the compatibility warnings). You might be amazed at how well these utilities can improve performance.

Now for some housecleaning: For XP, go to the Start menu and then Run; for Vista, go to the search bar. Type `msconfig` to open the System Configuration Utility. Click the Startup tab and uncheck any boxes except the following (if present): Windows display drivers, anti-virus/firewall software, soundcard drivers, systray, Windows Explorer, and anything listed under Microsoft Operating System. If you're unsure about a specific entry, take the safe route and leave it checked. Many times, some software, such as Apple's QuickTime, will start itself with Windows and auto-update in the background, hogging all your precious bandwidth.

QUICK TIP

To compare your ISP's stated connection speed with your download speeds, divide the speed your browser reports by 1024. Example: 550KB/sec / 1024 = .537 MB/sec.

Lastly, if you utilize DSL or cable, call your ISP and request a line-test. This is a quick and simple procedure, and while it can only be run from the provider's side, it can instantly reveal whether your residence is too far from the central office, suffering from severe signal degradation, etc.



FIX A DEAD CONNECTION

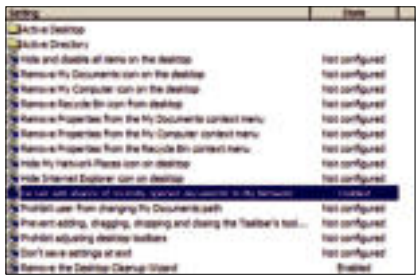
3 If you've hit a snag running any of the commands in Step 1, here are a few solutions to the most common errors.

1) You have an IP address, but no default gateway, even after releasing and renewing, or you can't ping a domain name.

In this case, make absolutely sure you have Windows configured for DHCP (or statically, should your ISP support it). For XP, go to the Start menu, then Run; in Vista go to Start or the search bar. Type `control netconnections` and click OK. Right-click your active icon (should be the one without a red X) and select Properties. From here, ensure that all boxes are checked and highlight Internet Protocol (TCP/IP) and click Properties. If you don't have a static IP, make sure there's a dot in the circle next to "Obtain an IP address automatically." If everything is set up correctly but your command lines are still failing, the ISP is probably at fault and will need to be contacted.

2) You pinged Google.com continuously but received an extraordinary number of timeouts.

The most common causes for this error are a conflict in an assigned public IP address or large amounts of interference with the connection due to, say, interior power cables running parallel to the residence's WAN line. Unfortunately, both of these issues necessitate a call to your ISP. However, if you list everything we've mentioned above, the conversation should be quick and torture-free, and while interference can take time to diagnose and resolve, assigning a new customer WAN IP should take no longer than five minutes.

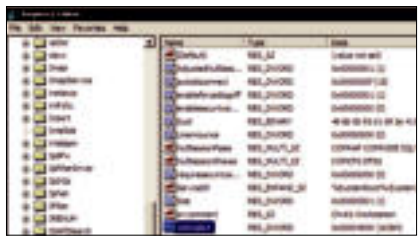


GET YOUR NIC UP TO SPEED

4 If you run Vista, turn off IPv6 if you don't use it. Doing so will typically result in better overall reliability. While you're inside your network connection properties (this applies to XP users as well), click the Configure button next to your network card's name and navigate to the Advanced tab and ensure that these properties (if listed) are set as follows: LAN Power State Link Speed: Disable; Optimize For: Throughput; Speed/Duplex Settings: Full Autonegotiation. Next, click the Power Management tab (if available) and make sure to uncheck "Allow the computer to turn off this device to save power."

For XP users only, go to Start, then Run, and type `gpedit.msc`. Click OK. (Note: You must have full admin rights to make this edit.) Find User Configuration and navigate to Administrative Templates, then Desktop, and right-click "Do not add shares of recently opened documents to My Network Places" and click Enable.

It's also a good idea to disable any unused network ports. Simply type `control netconnections` into XP's Run or Vista's search bar, click OK, and right-click the dormant icon and select Disable.



TUNE UP YOUR NETWORK

5 Flash that router firmware! Browse to your router manufacturer's website and do a quick download/update search. You should find new firmware in no time. Have an ISP-owned router that runs your LAN? Believe us: It's worth the dreaded phone call to have them update it—many ISP firmware bundles can instantly solve major download/upload speed issues.

Next, if you use a VoIP router in conjunction with your LAN and you want data packets at peak efficiency, plug in the VoIP router inside your internal LAN, not outside it. Sometimes, running your network through VoIP equipment prior to your personal or ISP router will auto-enable high priority for voice packets. It's good for phone calls, bad for data throughput and fragging.

If you're having slowdowns while sorting through network folders or shares, here's a DWORD that might help: type `regedit` into Run for XP or Vista's search bar, and find your way through HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\LanmanServer\Parameters. Next, right-click anywhere in the window and select New > DWORD Value. Now name the item SizReqBuf and right-click the entry and select Modify. Select the Decimal option and change the numeric value to 16384. After this, close out of the registry and reboot.

REPAIR BAD SETTINGS AND TIDY UP LOOSE ENDS

6 Network cards, like any other peripheral, require drivers. This is a good place to start when trying to repair a dead LAN. Next, if you've made any recent changes to your personal router and you're now faced with a nonresponsive or shaky connection, reset the hardware to factory defaults. Do so by depressing the small (often well-hidden) reset button on the back or bottom of your router with a ballpoint pen for about 30 seconds. After that, release it—your router will now be configured like the day you bought it, sans user-implemented errors. This is actually a smart first troubleshooting step for any networking errors or otherwise wonky behavior.

If you're still having trouble accessing network shares or shortcuts, see if your computer can resolve other computers' names on the network. Many routers will contain a breakdown of all attached devices' info (including the computer name and current IP address), but if your router lacks this functionality, you'll have to retrieve the data manually off every other rig. It's easy though— just right-click the My Computer icon on Vista or XP, go to Properties, click the Computer Name tab, and observe the "Full computer name" field. Once you've retrieved the necessary data, open up a `cmd` inside XP's Run or Vista's search bar. Try to ping each powered-on computer's name. If you receive an error stating "unknown host" or "could not find local host," go back to your run /search field and type `control netconnections`. Right-click your active LAN icon and hit Properties. From here, double-click Internet Protocol TCP/IP and then click the Advanced tab. Under the WINS tab, ensure that NetBIOS over TCP/IP is enabled. You should now be able to access your sibling network devices.

CABLE COMPARISON

CAT5 vs. CAT5e

Some folks wonder if there's really a difference between CAT5 and CAT5e cable. The answer is a resounding yes. The most important distinction is that basic Cat5 squeezes by on Ethernet and Fast Ethernet but doesn't support Gigabit. CAT5e, however, is rated for 350 megahertz, making Gigabit support a breeze, while at the same time enjoying full backward compatibility with Fast Ethernet; CAT5e also guards better against electrical interference, making it more robust for tight installations. If in doubt, replace your current wiring with CAT5e. This could save you some headaches in the long run.

This month the Doctor tackles...

- Email Access
- SP1 Updates
- Fire Safety

Send to Whom?

I've noticed a weird problem on a clean Vista 64 SP1 install. It first happened when I was using Picasa. I selected some photos and then hit "e-mail," but Outlook 2007 never popped up. I first thought it was just a Picasa problem, so I ignored it.

I then tried right-clicking a small file, choosing Send To, Mail Recipient, and again Outlook 2007 didn't open. As I understand it, the program should have opened a new message with the attachment.

Do you have any idea what could be going on?

—Jordan Grant

While a Windows reinstallation might be in your future, given that the issue undoubtedly relates to a registry glitch, you can try a few tricks before going back to square one. The first possible solution relates to your default client settings in Windows Vista. Click the Start button, select Default Programs, click Set Program Access and Computer Defaults, click the corresponding drop-down arrows under Custom, then select your mail client of choice, Outlook 2007 in this case. Click OK, and then click the Set Your Default Programs option. From this list, select the entry for Microsoft Office Outlook and choose the Set This Program as Default option. Click OK, restart your computer, and see if you can now use your right-click Send To functionality.

If that doesn't fix the problem, here's another option. Click the Start button and type `regedit` in the Start Search field. The registry editor should pop up. Browse over to the following directory: HKEY_CLASSES_ROOT\.MAPIMail. The default key in the data field should read: CLSID\{9E56BE60-C50F-11CF-9A2C-00A0C90A90CE}. If it doesn't, make it so. Then restart your computer and see if the mail function works.

Choose your default email client within the Set Program Access and Defaults page.

Vanishing Vista SP1

My wife and son have identical Dell Dimension E521 PCs that came with Vista. Neither one will recognize that the SP1 update exists. I have tried to update, but every time I check for one, it still tells me that no updates are available. Can you please help me get them updated to SP1?

—Jack Orkin

Vista SP1 might not appear in your Windows Update for a number of reasons. First, check to make sure that your OS hasn't already installed SP1. Click your Windows button and type `winver` in the search box. After you hit Enter, a screen will pop up. If SP1 is already installed, it'll say so right next to the version number that appears below "Microsoft Windows."

Make sure you have the most updated drivers for your machine, as SP1 will not appear unless you're running modern drivers for your videocard and integrated audio. Also, make sure you haven't hidden any mission-critical updates from Microsoft: Restore these by opening your Control Panel, clicking Windows Update, and selecting the Restore Hidden Updates option. Finally, make sure you've installed all the updates that Microsoft suggests you install, including any optional updates that aren't listed as "critical."

If you have done this and still don't see Vista SP1 as a potential upgrade via Windows Update, you can install the service pack yourself. Go to http://tinyurl.com/2w893p to download the package, then run it. The Doctor recommends this as the last possible solution because an SP1 installation might muck up your machine if Microsoft, through its Windows Update omissions, is suggesting that your system isn't ready. You should run a full backup of your system prior to installing SP1 manually.

SUBMIT YOUR QUESTION Are flames shooting out of the back of your rig? First, grab a fire extinguisher and douse the flames. Once the pyrotechnic display has fizzled, email the doctor at doctor@maximumpc.com for advice on how to solve your technological woes.

REVIEWS

Tested. Reviewed. Verdictized

INSIDE

85 SAPPHIRE RADEON 4870 X2

86 AVADIRECT CORE 2 CROSSFIRE DDR3 GAMING SYSTEM

88 GIGABYTE MA 790GP-DS4H

90 INTEL X-25M SSD

92 ZALMAN Z-MACHINE LQ1000

93 COOLER MASTER V8

94 EYE-FI EXPLORER

95 SPORE

96 BROTHERS IN ARMS: HELL'S HIGHWAY

97 LAB NOTES

ONLINE

- LENOVO THINKPAD W700
- SLACKER G2 PERSONAL RADIO
- TRENDNET TV-IP422W IP CAMERA
- COWON A3 PORTABLE MULTIMEDIA PLAYER
- MICROSOFT SIDEWINDER X5
- STEELSERIES IKARI
- RAZER DEATHADDER
- IOGEAR USB LAPTOP KVM SWITCH
- IOGEAR DVI NET SHARESTATION

PLUS Best of the Best, Editors' Blogs, and the No BS Podcast

Sapphire Radeon 4870 X2

The fastest videocard we've ever tested—for the most part

Sapphire's Radeon 4870 X2 sports 2GB of memory and cranks the benchmarks like we've never seen.

For a long time, we've considered videocards that sport two GPUs second-class citizens. They have all the problems of multi-card solutions—namely application incompatibilities and no multi-monitor support—but fail to perform as well as dual-card solutions, since multi-GPU cards usually use slower midrange GPUs. That's finally changed with the new RV770-powered Radeon 4870 X2, which mounts two of ATI's fastest GPUs on a single card, without sacrificing power-user features like multi-mon support.

The 4870 X2 is essentially two Radeon 4870 HD cards running in CrossFire mode packed onto a single board: The X2 has the same GPUs, the same 800 shader cores running at the same 750MHz core clock, and the same GDDR5 memory running at 900MHz. But, there is one difference. The single-GPU 4870 includes 512MB of memory, while the X2 has a whopping 2GB. However, the memory is duplicated between the two GPUs, so the effective frame buffer for the card is just 1GB. The X2 also features a high-speed PCI Express interconnect between the two GPUs, which should, theoretically, boost the efficiency of the shared GPUs. However, in our tests, we didn't see an appreciable performance difference between a traditional CrossFire solution and the X2.

The 4870 X2 outperformed the previous single-card performance champ in most of our benchmarks, delivering playable frame rates at 1920x1200 and 2560x1600 in nearly every game we tested. Naturally, the exception remains Crysis, which, at its highest quality settings, punishes nearly every system we've tested. We're slightly concerned about the accuracy of our Crysis benchmarks; the ATI card seemed to render far-off textures at a higher resolution than the Nvidia card. We'll test further and report back next month.

As always with high-end cards, if you're running a low-resolution display—pretty much anything below 1920x1200—you won't be able to harness the full power of this card. At lower resolutions, the 4870 X2 performs exactly the same as the single-GPU 4870. For anyone running a high-res panel, the X2 truly kicks ass.

This card is a significant upgrade if your GPU doesn't support DirectX 10—and is much better than some last-gen cards that do. If you've been waiting to make the jump to DX10, now's the time to shell out the bucks—you won't see a better performer for quite a while. –WILL SMITH

BENCHMARKS

	Radeon 4870X2	GeForce GTX 280
Crysis 4X AA/Very High (fps)	16.3	**17.4**
Crysis noAA/Very High (fps)	**21.6**	20.8
Call of Duty (fps)	**81.8**	68.3
Vantage Game 1 (fps)	10.8	**17.6**
Vantage Game 2 (fps)	**13.0**	12.1
UT3 (fps)	**131.0**	124
Grid (fps)	35.9	**46.0**

Best scores are bolded. Benchmarks are run on an Intel Core 2 Quad Q9770 Extreme, with 4GB of memory running Windows Vista. All tests are run at 1920x1200, with 4x AA and 8x anisotropic filtering, unless otherwise noted.

MAXIMUM PC KICK ASS!

VERDICT **9**

SAPPHIRE RADEON 4870 X2

+ X-MEN	- X-FACTOR
CrossFire performance from a single card. Can drive 1920x1200 gaming!	Higher power requirements than a single-GPU card; noisy.

$600, www.sapphiretech.com

AVADirect Core 2 CrossFire DDR3 Gaming System

The air-cooled 4GHz Core 2 slays, but shipping issues persist

Its official name is Core 2 CrossFire DDR3 Gaming System, but you can just call it the Quad Meister or Quaderino, if you're into the brevity thing. What else could you possibly call a PC equipped with two ATI Radeon 4870 X2 cards (quad GPU cores), four Velociraptors (quad hard drives) and an overclocked Intel Core 2 Extreme QX9770 (uhh, quad cores)? Maybe we're stretching here, but our nickname is certainly sexier than the PC's official moniker.

This rig's components are housed in an NZXT Khaos case with a custom laser-cut side. Optical storage is handled by a Samsung DVD burner and an LG Blu-ray burner. In magnetic storage, AVADirect hit us with a head scratcher. It equips the machine with four 150GB Velociraptor drives. Yeah, you read that right—WD makes a 150GB version of its spectacular Velociraptor drive. An Alphacool LCD display and a Corsair 1000HX PSU round out the package.

AVADirect stripes the four 150GB Velociraptor into one big RAID 0 array but doesn't include a backup drive. Storing anything you care about on such an array is like trying to steal home—it's a big risk for a big reward.

The last AVADirect machine we reviewed, the AVADirect Core 2 Duo SLI Gaming System (December 2007), was damaged during shipping and leaked coolant all over the place. This time, the company went with air cooling and, amazingly, was able to get the QX9770 overclocked to 4GHz using a heatsink fan the size of Jupiter. The good news is that it passed our stress test with flying colors. The bad news is that this machine also came damaged and had several screws stripped loose.

The PC features tasteful lighting and an informative front display.

The Quaderino was roughly five percent slower than the Digital Storm Benchmark Crusher we reviewed last month (the Crusher's water-cooled CPU was clocked about five percent faster). In gaming, the showdown was between the Crusher's tri-SLI GTX 280s and the Quaderino's Radeon HD 4870 X2 cards. In our UT3 test, the Quaderino was about 13 percent faster than the Crusher. In Crysis, however, the Radeons took a backseat to the GeForce cards. While the Digital Storm could belt out 54 fps in Crysis, the AVA Direct was down at 34 fps. Why? One theory is that since Crysis supports just three GPUs for gaming, the Radeons are at a disadvantage since each individual GPU core is slower than an individual GTX 280.

While Crysis is the more graphically intense game, we're calling this fight a draw—especially since the Digital Storm system turns the price knob up to $9,000 while the AVADirect machine is $6,000.

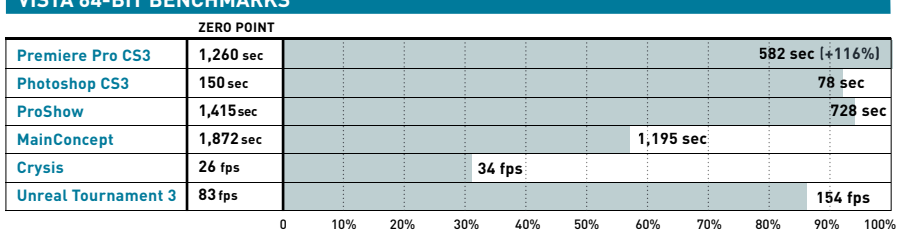
The AVADirect box is a nice machine and sensibly priced, given the amount of hardware it packs. We question the storage configuration and are a bit concerned about getting two consecutive machines with shipping damage from the company. AVADirect needs to either look at its packaging or buy its shipping guy a cookie bouquet.

Still, the Quaderino is a fast box and represents well as the first PC we've received this year without a GeForce in it. **–GORDON MAH UNG**

SPECIFICATIONS

PROCESSOR	Intel Core 2 Extreme QX9770 (3.2GHz overclocked to 4GHz)
MOBO	Asus Rampage Extreme (Intel X48 chipset)
RAM	Corsair 4GB DDR3/1600
VIDEOCARD	Two Sapphire Radeon HD 4870 X2s in CrossFire
SOUNDCARD	Onboard HD Audio
STORAGE	Four Western Digital Velociraptor 10K 150GB in RAID 0
OPTICAL	Samsung SH-S223, LG GGW-H20L
CASE/PSU	NZXT Khaos/Corsair 1000HX PSU

VISTA 64-BIT BENCHMARKS



Our current desktop test bed consists of a quad-core 2.66GHz Intel Core 2 Quad Q6700, 2GB of Corsair DDR2/800 RAM on an EVGA 680 SLI motherboard, two EVGA GeForce 8800GTX cards in SLI mode, a Western Digital 150GB Raptor and 500GB Caviar hard drives, an LG GGC-H20L optical drive, a Sound Blaster X-Fi and PC Power and Cooling Silencer 750 Quad PSU, and Windows Vista Home Premium 64-bit.

VERDICT 8

AVADIRECT CORE 2 CROSSFIRE DDR3

+ BEN STILLER

Fast and a good value for the hardware it packs.

– BEN STEIN

Loud and no safety net for small RAID array.

$6,020, www.avadirect.com

Gigabyte MA 790GP-DS4H

Integrated graphics that don't suck (much)

Pardon us, but crowing that your integrated graphics chip is better than your competitor's integrated graphics chip is a bit like bragging that your D is better than your friend's D-.

As sad as that is, it's the tack AMD is taking with its 790GX chipset, which Gigabyte's MA790GP-DS4H mobo is based on. While the chipset features DirectX 10 support and indeed might be faster than other integrated graphics solutions, it's still slower than the ancient GeForce 7600 GS we compared it to.

The 790GX does support a hybrid mode, which allows you to pair an equally weak Radeon HD 3400-class GPU with the board. By adding the subpar performance of the Radeon to the integrated graphics, you immediately realize you should have purchased a better videocard. If that were the only story, we'd already be done with the 790GX. What's interesting is that AMD's latest chipset scales from dirt-poor integrated, to illogical hybrid support, all the way up to full CrossFire support. The MA790GP-DS4H takes full advantage of the CrossFire slots and lets you run two GPUs at full x16 PCI-E 2.0 data rates. However, Gigabyte makes a faux pas by pointing the SATA ports straight up. If you were to run two double-wide GPUs in the board, several SATA ports would be cut off.

The real news concerning the Gigabyte board is the inclusion of AMD's new SB750 south-bridge chip, which adds RAID 5, additional SATA ports, and the ability to directly overclock the CPU further than you could before, theoretically. Our Phenom overclocks have been good but not stellar, and we didn't seem to get much further with the new SB750, so your mileage may vary.

In our benchmarks, the board's performance was all over the map, with hard drive scores particularly low. Only after installing a patch provided to the media (with the warning that it could result in data loss) did we see performance actually match that of boards based on the 790FX chipset. We imagine that final drivers will include the patch, but it's obvious to us that the MA 790GP-DS4H's drivers weren't fully baked for the release, so color us unimpressed. –GORDON MAH UNG

VERDICT 6

GIGABYTE MA 790GP-DS4H

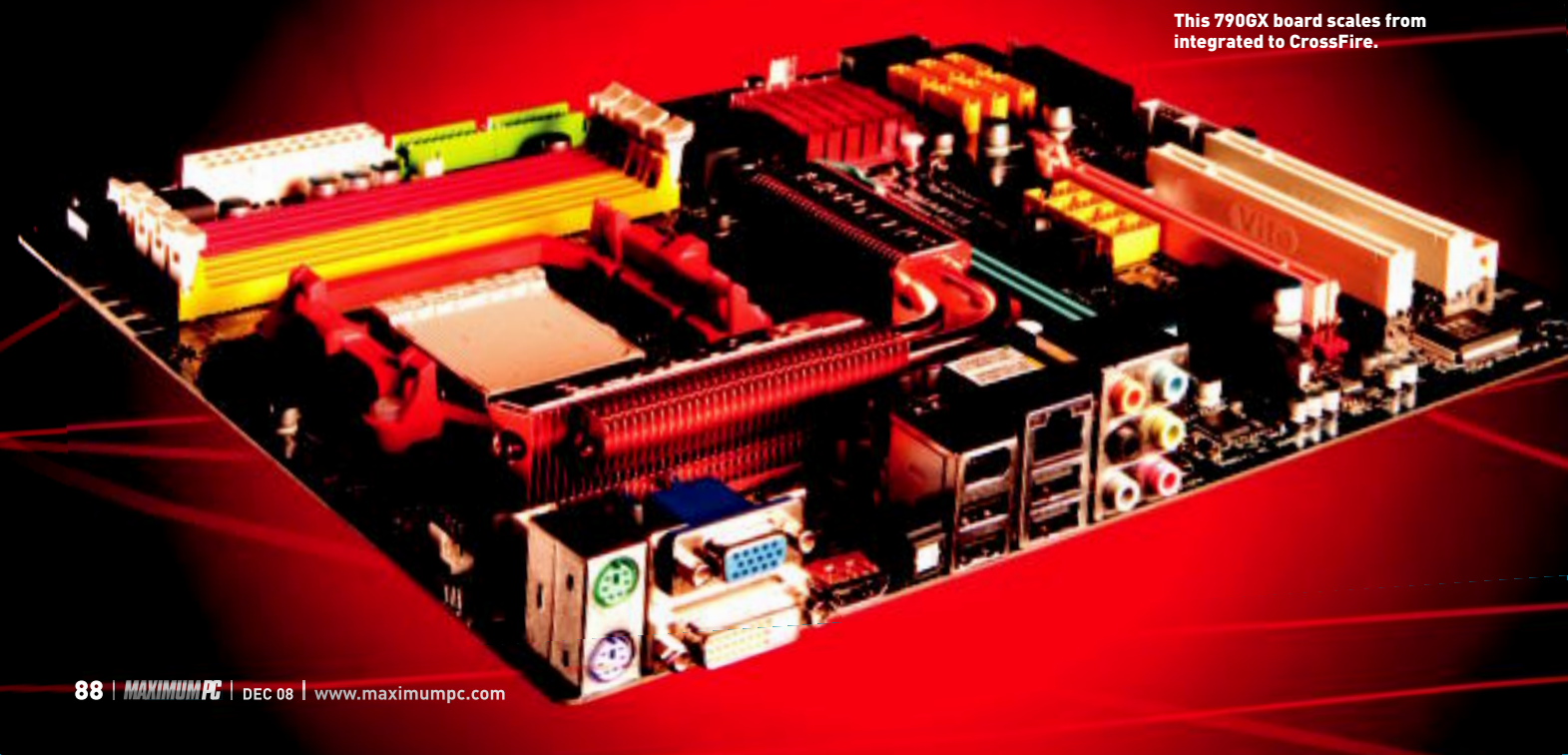
+ CODEX LEICESTER	– DA VINCI CODE
Scales from integrated to full-tilt CrossFire support.	Poor SATA port placement; BIOS disables USB keyboard support by default.

$145, www.gigabyte.com.tw

BENCHMARKS

	Gigabyte MA790GP-DS4H	Asus M3A32-MVP
PCMark GPU	11,663	**12,610**
3DMark06 Overall	11,571	**12,020**
HD Tach Average	59.3	**77.4**
Valve Particle test	66	**71**
UT3 standard (fps)	76	**83**
FEAR Max/min (fps)	173	**213**
Quake 4 low (fps)	166	**152.7**

Best scores are bolded. Our test bed consists of a Phenom 9950BE, 2GB of DDR2/800 RAM, a 150GB WD Raptor hard drive, a GeForce 8800 GTX, and Windows XP SP2.



This 790GX board scales from integrated to CrossFire.

Intel X-25M

Get RAID 0 read performance in a single drive

Laptop users, rejoice—you finally get desktop-drive level performance.

How big a deal is Intel's entry into the solid-state-drive game? The announcement of the company's new X-25M SSD, and a faster version for enthusiasts, all but overshadowed details of the company's next-generation CPU at its fall developer conference.

After testing Intel's entry-level SSD, we can understand why. The X-25M offers the fastest read speeds we've ever seen from a single SSD or hard drive.

How fast? The 10,000rpm Western Digital Velociraptor (reviewed September 2008) offered sustained transfer speeds of 98MB/s. The $1,500 MemoRight MR25.2-32/64S GT from our SSD roundup (November 2008) turned in read speeds of 112MB/s. The Intel X-25M hits 206MB/s read speeds.

Not all is roses though. The X-25M SSD is based on the more-affordable multilevel chip (MLC) technology. The Achilles' heel of MLC drives is subpar write performance. For example, the RiData and Super Talent MLC-based drives in our seven-drive SSD roundup averaged write speeds of about 23MB/s. The X25-M is almost three times faster than the other MLCs, but it can't touch the write speed of drives that are based on single-level chip (SLC) memory. The slowest SLC drives hover in the 80MB/s range, with the faster drives pushing 100MB/s.

The X-25M SSD took a hit in our Premiere Pro benchmark, in which we write an uncompressed Microsoft AVI to the drive. The Velociraptor hard drive continues to be the best performer in our Premiere Pro benchmark, with the Memoright SSD coming in a close second.

That's probably the only thing that dampens our enthusiasm for this drive. The X-25M's read speeds are simply to die for—you'd have to run lesser SSDs or hard drives in RAID 0 to even come close. Just think about what you'd get from two X-25Ms in RAID 0.

This is just one of many SSDs you can expect from Intel. The company plans to release a 160GB SSD next year. For enthusiasts, Intel will soon introduce the X-25E, with 250MB/s reads and 170MB/s writes. Because it will use SLC technology, though, it'll be far pricier.

As for the X-25M, we're unimpressed by its write performance, but since its read speeds are twice as fast as those of the other SSDs we've tested, and it costs about a third of what the fastest SLC drive on the market runs, we have no choice but to pronounce it Kick Ass worthy. –GORDON MAH UNG

BENCHMARKS

	Intel X25-M	Memoright MR25.2-032/64S	Western Digital VelociRaptor
Capacity	80GB	64GB	300GB
Average Sustained Transfer Rate Read (MB/s)	**206.65**	112.47	98.31
Average Sustained Transfer Rate Write (MB/s)	64.30	**106.60**	98.22
Random Access Read (ms)	0.12	0.09	7.24
Random Access Write	**0.09**	1.46	3.42
Premiere Pro (sec)	621	411	**383**
PCMark Vantage Overall Score	**30,322**	13,527	6,082

Best scores are bolded. Our test bed consists of an EVGA 680i SLI motherboard running an Intel Core 2 Quad Q6700 CPU, an EVGA 8800 GTX videocard, 2GB of DDR2/800 RAM, and a 7,200 RPM Western Digital 500GB Caviar drive. Windows XP SP3 is used for the H2WBench and Premiere Pro CS3 scores and Windows Vista Home Premium is used for the PCMark Vantage score.

MAXIMUM PC KICK ASS!

VERDICT 9

INTEL X-25M

+ PARADIDDLE	– PARAGLIDER
Pushes the limits of the SATA 3GB interface!	Write speed is just average.

$600, www.intel.com

Zalman Z-Machine LQ1000

A good fusion of water and chassis, just not good enough!

We were apprehensive when we first saw Zalman's Z-Machine LQ1000 case. From the outside, the chassis looks like a combination of the company's Fatal1ty FC-ZE1 case (reviewed February 2007) and its Reserator XT external water cooler (reviewed December 2007). But this case isn't simply a slapped-together hybrid of two products. Zalman packs a number of improvements into the LQ1000.

The LQ1000 abandons the frustrating billion-screw design of its predecessor, the FC-ZE1, for a thumb-screwed side panel. The case's drive bays use the same tool-free design as the FC-ZE1, but the mounting mechanisms for the case's four 5.25-inch bays are all tool-free as well.

A monstrous 10x14.25-inch reservoir attaches to the inside of the case's side panel. It uses 3/8-inch tubing that connects to a 79.25 gallon-per-hour pump attached to the bottom of the chassis. Zalman supplies one of its own water blocks, the ZM-WB5, for your CPU, and it's compatible with both Intel and AMD systems.

The water-cooling loop's performance crushes that of a stock cooler and even outpaces that of our top air cooler, Thermaltake's DuOrb.

However, we dislike the lack of tubing between the pump's outflow and the water block's input. It's an extremely short run that doesn't leave much room for tube routing. Similarly, the inside of the case is tight. An 8800 GTX videocard brushes up against the hard drive bays.

On the case we received, the connector for the front-panel power button was mislabeled as "HD LED," and the connection didn't work. Also, the side panel holding the motherboard tray didn't line up against the panel covering the drive bays, letting a sliver of light sneak through the case. It's a minor flaw, but frustrating if you plan to pack the inside of the case with swanky lights.

While this is certainly one of the better water-cooling chassis we've tested, it's not perfect. Zalman has made some improvements to its previous designs, but the LQ1000 could stand a bit more polish. —DAVID MURPHY

BENCHMARKS

	LQ1000 (low)	LQ 1000 (high)	Stock Cooler
Idle (C)	**27.7**	28.5	38.5
100% Burn (C)	47	**45**	66.8

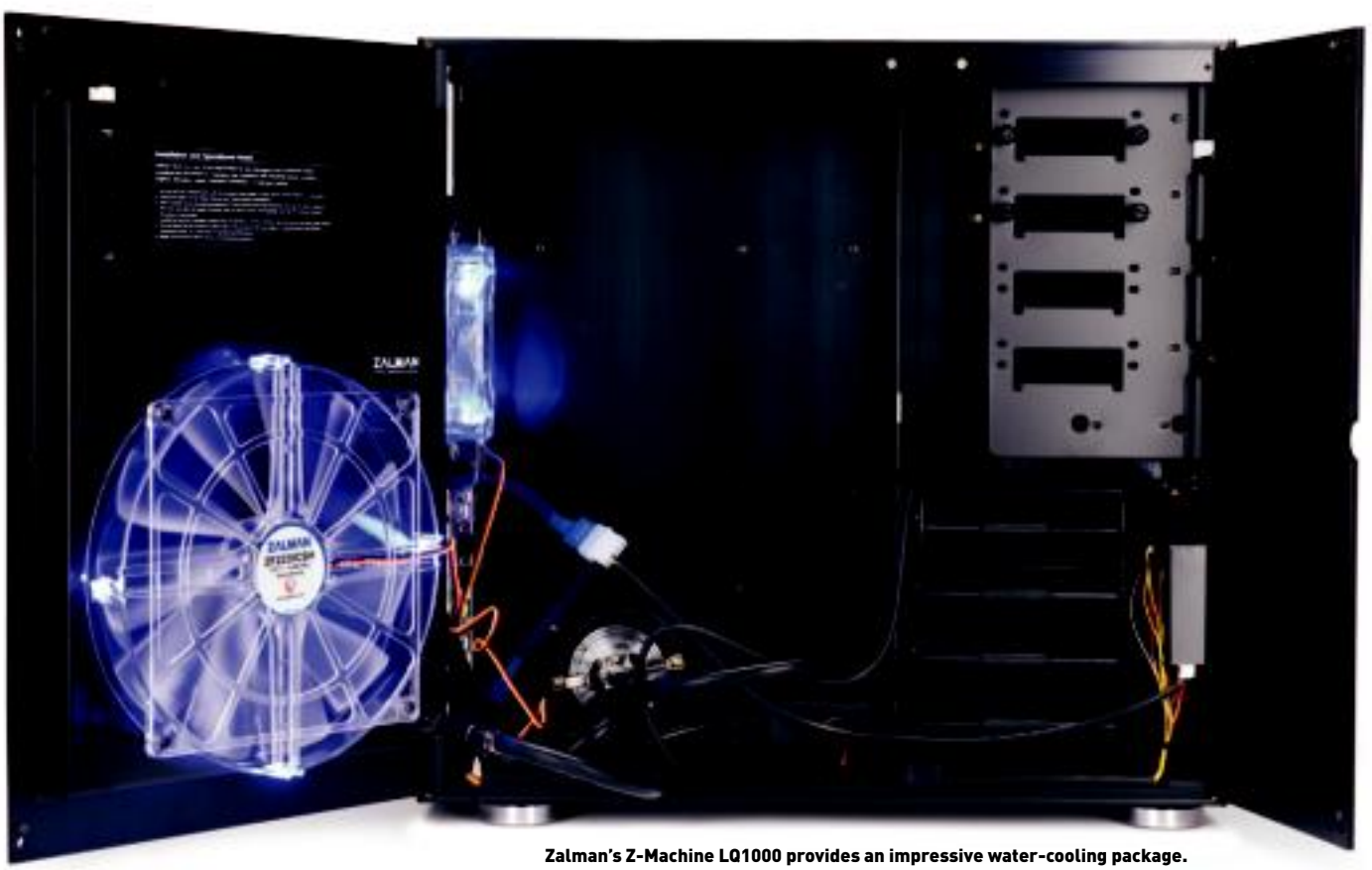
Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour's worth of CPU Burn-In (four instances). Test system consists of a stock-clock Q6700 processor on an EVGA 680i motherboard.

VERDICT 7

ZALMAN Z-MACHINE LQ1000

+ RED BEAN PASTE	− THERMAL PASTE
Powerful water-cooling; great fusion of liquid elements into the chassis.	Design frustrates; no performance difference in cooler s low and high operations.

$700, www.zalmanusa.com



Zalman's Z-Machine LQ1000 provides an impressive water-cooling package.

Cooler Master V8

A healthy cup of cooling for your CPU

Cooler Master's V8 CPU cooler offsets a somewhat time-consuming installation process with near-record-setting performance for an air cooler. The sleek aluminum cooler's 12cm fan sits between two heatsinks on the device, sparing fingers from the accidental nip of its 800rpm-to-1,800rpm variable fan.

The V8's installation process is similar to that of most other CPU coolers, but with a few more screws involved. On an Intel platform, you start by attaching two retention plates to the cooler itself. You then remove the motherboard from your case and flip it upside-down, matching the ends of the cooler's four retention screws with the mobo's holes. You balance this contraption in your lap while using four large nuts to secure this beast of a device in place. You can also use an included backplane to mount the device, but we found the nut method to be far easier.

The 16-centimeter-tall V8 emits a slight red glow when you power up your machine. You adjust the speeds of the included fan using a knob that you can secure to your PC using an included PCI bracket. At its lowest setting, the cooler easily outperforms a typical Intel stock cooler and comes within a few degrees of our top air cooler, Thermaltake's DuOrb. Cranking the V8 to its highest setting makes for a bit more noise than the DuOrb but produces only a meager two-degree increase in cooling performance on both our idle and burn tests.

This performance, nevertheless, places the V8 in the top echelon of coolers we have tested—second place, to be exact. The installation process isn't a picnic, but we've experienced worse. All and all, it's a great addition to a machine—both aesthetically and thermally. –DAVID MURPHY

VERDICT 9

COOLER MASTER V8

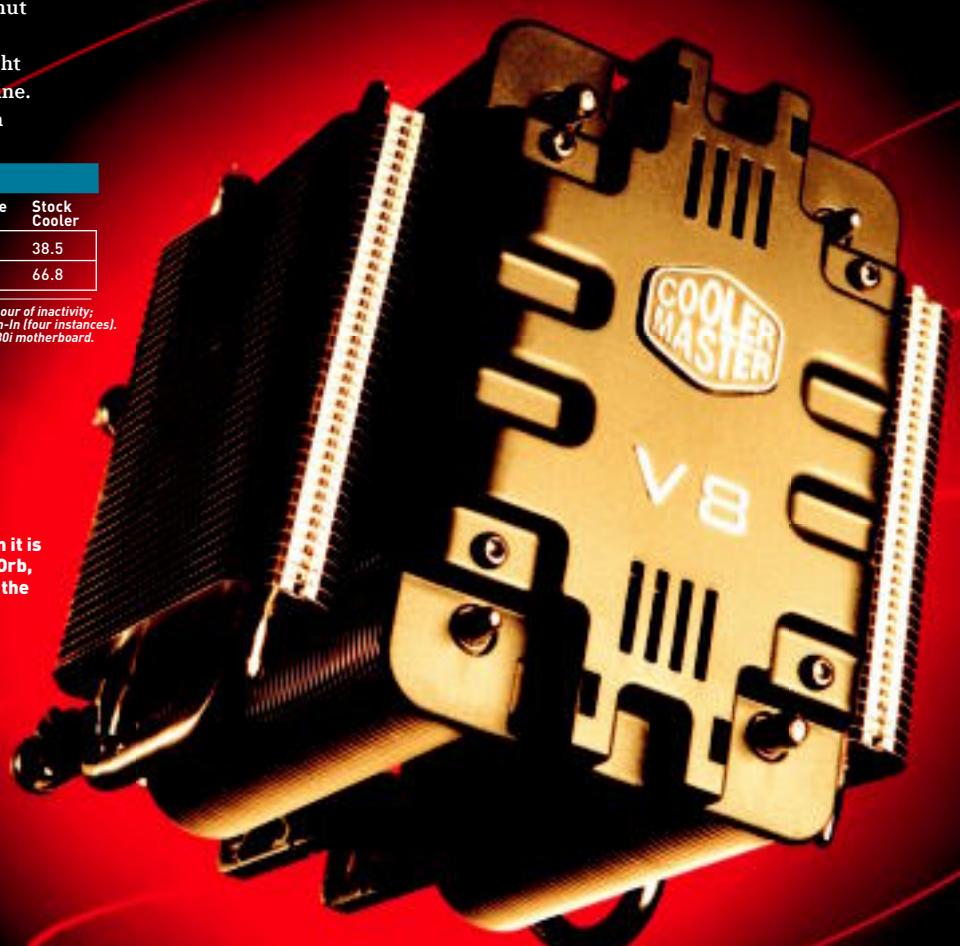
+ GIN	– JUICE
Nearly top-notch cooling performance, beautiful aesthetics.	Not that much of a cooling difference between low and high fan speeds.

$70, www.coolermaster.com

BENCHMARKS

	V8 (low)	V8 (high)	Thermaltake DuOrb	Stock Cooler
Idle (C)	34.8	**33.3**	33.5	38.5
100% Burn (C)	58.8	56.3	**52.3**	66.8

Best scores are bolded. Idle temperatures were measured after an hour of inactivity; load temperatures were measured after an hour's worth of CPU Burn-In (four instances). Test system consists of a stock-clock Q6700 processor on an EVGA 680i motherboard.



We like that the V8 is taller than it is wide. Unlike Thermaltake's DuOrb, this cooler doesn't block any of the parts on our motherboard.

Eye-Fi Explore

Untether your camera from your PC

The Explore finally lets you use unsecured access points to upload your photos—and it includes geo-tags to boot.

When we reviewed Eye-Fi's original wireless SD card (March 2008), our verdict was that this device, which lets you automatically upload images to the Internet via Wi-Fi, was a cool gee-whiz item hurt by a number of flaws. This update fixes those weaknesses and turns this wireless card into a must-have item for photo-sharing.

The original card worked with only secured access points that you had to program in manually. With the Explore, if you take a photo at the park and then walk into the range of one of the 10,000 supported hot spots (you get one year of free access; subsequent years cost $20), the camera will automatically start uploading your pics to the photo-sharing website of your choice. Even better, walk near an unsecured access point and the Explore will climb aboard and upload your photos from there.

You can either access just your secured access points or turn on open hotspot support, but there's no way to limit which open access points the card will seek out—and using an open access point without permission is against the law in some states. The card's geotagging feature isn't perfect either. The tags are not based on GPS coordinates; rather, they're based on a survey of Wi-Fi networks by Skyhood Wireless. The company claims to have millions of access points mapped, but that won't help you if you're standing on top of Half Dome at Yosemite.

Even with these problems, the Eye-Fi Explore is damned cool. For users of the original card, a firmware update adds the geotagging and hotspot support, so there's no reason to upgrade.

Now if Eye-Fi could increase the storage capacity beyond 2GB and make a Compact Flash version we'd be even happier.

—GORDON MAH UNG

MAXIMUMPC KICK ASS!

VERDICT 9

EYE-FI EXPLORE

+ JAMES ROCKFORD	− LANCE WHITE
Open access-point support makes the Explore a kick-ass, must-have card.	Reliance on Wi-Fi makes geotagging unreliable.

$130, www.eye.fi

Spore

The universe is your oyster in the latest entry from Will Wright

When it's time to expand your empire, you can purchase new solar systems or conquer them. You can guess which option we chose.

Spore lets you take an extremely high-concept journey from a single-cell life form swimming through the seas to a continent-spanning superpower to the overlord of a galactic empire. Over the course of about five hours, you shepherd your critter through four introductory stages; then you leave for space.

That's right, the first four stages of the game—cell, creature, tribe, and civilization—essentially train neophyte gamers to play common game genres: primarily MMO, RTS, and turn-based strategy. You then apply these skills when your fledgling species emerges from its gravity well for the first time. Despite lacking the depth we'd expect from a stand-alone game, the training stages are quite entertaining. You make very simplistic choices: Are you a carnivore or an herbivore? Do you fight or befriend other tribes? Will you be an economic, religious, or military superpower?

Once you leave your planet, the game begins in earnest. You travel between the stars, expanding your empire by conquering, colonizing, or buying planets from alien races. As you become stronger, you encounter increasingly powerful aliens, culminating in an epic battle at the center of the galaxy. The space game is packed full of gameplay, with an essentially infinite galaxy to conquer.

Spore is a technological triumph. By procedurally generating art for everything in the game, all the relevant data about your species fits into a few small PNG files, which are uploaded to the Spore servers. While you play, you download other players' species in the background, where they populate your planets and galaxy, which gives an already massive game infinite replay value.

We were disappointed by the game's lack of an auto-save feature; a few crashes cost us hours of progress. And as your empire grows massive, it becomes increasingly difficult to manage. Despite these flaws, Spore is a game that everyone should play. **—WILL SMITH**

SPORE

VERDICT 9

+ POWERS OF TEN	− POWER OF ATTORNEY
There s never been a game with as wide a scope as Spore. Simply breathtaking.	No auto-save, no planetary automation, and an occasional crash deny Spore a Kick Ass.

$50, www.spore.com, ESRB: E

BIA: Hell's Highway

Pick up a rifle and join the family, soldier

Brothers in Arms combines a compelling tale with verisimilitudinous graphics.

We've played plenty of World War II shooters but have yet to find one that makes us care for its characters like we did for Tom Hanks and Vin Diesel in *Saving Private Ryan*. Brothers in Arms: Hell's Highway comes close and rekindles our love of gritty 1940s warfare with its perfect combination of nail-biting tactical shoot-outs and a gripping character-driven story—an admirable feat in modern first-person shooters.

As Matt Baker, you've come a long way since first leading your squad in the original game. Your men aren't just nameless soldiers—each squad member is brought to life with a unique likeness and vocal personality. And this time around, you have additional troops at your command to relinquish the Nazis from their hold on Holland. Deployable base-of-fire, assault, machine gun, and bazooka fire teams pin down enemies while you sneak around adjacent hedgerows to flank, a reliable tactic which offers many rewarding strategic approaches on the battlefield.

In one particularly memorable mission, we tried to reclaim the city of Eindhoven from Nazi control. Firefights took place in farms, churches, and graveyards, and on the city streets, where every fence and building corner became an opportunity to take cover. We directed a machine gun team to suppress a sandbag fortification and instructed our bazooka team to blow up a nearby steeple, where a sniper was hiding. The diverse arrangement of battlefields—both indoor and outdoor—kept the action fresh.

Requisite sniping and tank-driving missions are fun breaks from the tense tactical gameplay but are a little too easy. The visuals and production values are also impressive, with plenty of cinematic details to enhance the drama. But Hell's Highway's greatest asset is that it never loses sight of its (often dark) story, and the gameplay is better for it. **—NORMAN CHAN**

VERDICT 9

BROTHERS IN ARMS: HELL'S HIGHWAY

+ COCONUT CLUSTERS	− CLUSTER BOMBS
Character-driven story, intense tactical action, and gorgeous cinematic presentation.	Forgettable multiplayer mode and linear tank missions.

$50, www.brothersinarmsgame.com, ESRB: M

LAB NOTES

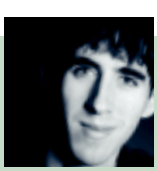
GPU-Accelerated Video Encoding

We take Elemental's Badaboom H.264 encoder for a test drive to see if the GPU is ready to take the CPU to task

WILL SMITH
EDITOR-IN-CHIEF

Nvidia and ATI have been claiming that the programmable GPU that sits idle in your videocard anytime you're not playing games is a massively parallel supplement to the CPU nestled in your motherboard. To see how the early GPU-powered apps work, I tested Badaboom—which converts MPEG-2 video on DVDs to H.264-encoded video suitable for playback on iPods and PSPs. To get the full story, I compared Badaboom's performance and video quality to Handbrake's, a popular CPU-powered H.264 encoder.

After poring over hours of encoded video using both apps, I determined that Handbrake, whose X264 encoder uses the better "high" profile for encoding, produces better-looking video when encoding to the DVD source's native resolution. When I set Handbrake to use similar quality settings as Badaboom, the CPU-powered app smoked the GPU-powered app. Check out my full write-up online at http://tinyurl.com/4d4omu.



DAVID MURPHY
ASSOCIATE EDITOR

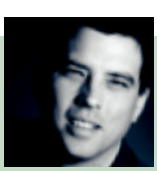
I've been arm-deep researching the future of storage and displays for this month's technology preview (page 24). I've also been planning my own future, and will be leaving the magazine after this issue. I'll miss working with some of the industry's best tech journalists. Murphy, out!

KATHERINE STEVENSON
DEPUTY EDITOR

For the last year or so, I've been using ING.com for banking and loving it. The site lets me easily transfer funds from my traditional savings and checking accounts into any of ING's banking or investment vehicles—which offer better interest rates—and then back again to my checking account when I need to access my money.

GORDON MAH UNG
SENIOR EDITOR

I gave up on small, powerless notebooks years ago, so it was a joy when I got my hands on the anti-netbook: Lenovo's Thinkpad W700 (http://tinyurl.com/3uyzky). Featuring a quad-core CPU, high-color-gamut display, integrated Wacom-tablet, and 1GB frame-buffered GPU, it's a beast in both size and performance. In my book, it's worth the backache.



TOM EDWARDS
MANAGING EDITOR

This month, I spent time at the annual CTIA trade show. I checked out a load of new handsets and mobile apps and also learned about the future of voice recognition software. Look for a story about the latter on MaximumPC.com later this month.

NORMAN CHAN
ONLINE EDITOR

After recently switching from Internet Explorer 7 to Firefox 3, both Microsoft and Google released new beta browsers to test my resolve. Chrome's elegant interface and zippy speed are compelling, but where are my add-ons? I can't live without mouse-gesture navigation (à la Firegestures).

Win Rig of the Month

IF YOUR MODDED PC IS CHOSEN AS A RIG OF THE MONTH, IT WILL:

1 Be featured before all the world in *Maximum PC*
2 Win you a $250 gift certificate

SO WHAT'S STOPPING YOU?

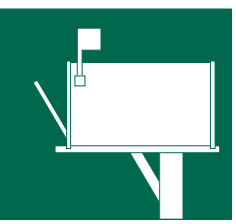
TO ENTER: Your submission packet must contain your name, street address, and daytime phone number; no fewer than three high-res JPEGs (minimum size 1024x768) of your modified PC; and a 300-word description of what your PC represents and how it was modified. Emailed submissions should be sent to **rig@maximumpc.com.** Snail mail submissions should be sent to Rig of the Month, c/o Maximum PC, 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080.

The judges will be *Maximum PC* editors, and they will base their decision on the following criteria: creativity and craftsmanship.

ONE ENTRY PER HOUSEHOLD. Your contest entry will be valid until (1) six months after its submission or (2) the contest ends, whichever date is earlier. Each month a winner will be chosen from the existing pool of valid entries and featured in the Rig of the Month department of the magazine. Each of the judging criteria (creativity and craftsmanship) will be weighed equally at 50 percent. By entering this contest you agree that Future US, Inc. may use your name and your mod s likeness for promotional purposes without further payment. All prizes will be awarded and no minimum number of entries is required. Prizes won by minors will be awarded to their parents or legal guardians. Future US, Inc. is not responsible for damages or expenses that the winners might incur as a result of the Contest or the receipt of a prize, and winners are responsible for income taxes based on the value of the prize received. A list of winners may also be obtained by sending a stamped, self-addressed envelope to Future US, Inc. c/o Maximum PC Rig of the Month, 4000 Shoreline Ct, Suite 400, South San Francisco, CA 94080. This contest is limited to residents of the United States. No purchase necessary; void in Arizona, Maryland, Vermont, Puerto Rico, and where prohibited by law.

We tackle tough reader questions on...

Powerful Supercomputers
Dot Pitch
Hard Drive Partitions



Crushed by Crysis

In reading your review of the Digital Storm Benchmark Crusher (November 2008), you note how that monster rig generated only 20 fps in your Crysis benchmark at 2560x1600 resolution. Even at 1920x1200, a score of 54 fps on a system running over 4GHz with three of Nvidia's top-end GPUs is hardly what one could call acceptable. On my simple dual-core, single GTX 280 desktop machine, I had to endure hours of tweaking to get Crysis to an acceptable compromise of visuals and performance. While it's good that the game can be tuned, such changes should not be necessary. Crysis reeks of poor coding, and since Electronic Arts is not going to release any more updates, it's probably time to put it out to pasture.

—Ed Piotrowski

Editor in Chief Will Smith Responds: Despite its flaws as a game, almost a year after its release I can still say that Crysis is the most graphically advanced game I've ever tested. The game's visuals are every bit as lush and appealing as they were a year ago, and we're just now starting to test hardware that can run Crysis at the highest resolution and quality settings.

However, I do agree with you that the game was poorly coded. Whatever technique the game uses to "auto-configure" the graphics settings is inadequate. I've always been able to get the game to the same frame rate and looking a little better than the auto-config script. I love that power users have the opportunity to get their tweak on with the advanced settings, but the vast majority of gamers—the ones who've never seen the inside of an Advanced Settings panel—shouldn't have to be bothered.

Connecting the Dots

In your recent article titled "The New Wave of LCDs" (October 2008), you missed one important and often overlooked specification: dot pitch. Dot pitch has always been a very important number to look at. The rule of thumb was to make sure the dot pitch was .28mm or lower. Lately, I have seen a lot of new monitors with higher than .28mm dot pitch. Is this because the dot pitch is now being measured horizontally instead of diagonally or perhaps the TV/monitor manufacturing process is being melded together and the quality just isn't there? I am desperately looking for answers, please help!

—Sergio

Deputy Editor Katherine Stevenson Responds: Dot pitch, also known as pixel pitch, describes the distance between sub pixels of the same color on an LCD screen. In theory, the smaller the space, the sharper the picture. Among screens of the same size and resolution (i.e., the number of pixels on the screen) there's virtually no variation in dot pitch. That's not to say you won't see varying specs, however; just as many display specs are measured and reported in non-standard ways, so

NOW ONLINE

Screwdriver Showdown

As experienced PC builders, we know that not all screwdrivers are created equal. A generic $5 Phillips head may be more reliable than a $50 multi-tool. We review 26 screwdrivers to find the one to rule them all. Go to http://tinyurl.com/3l5nlw to check out all the details.

too is dot pitch—some manufacturers measure on the horizontal (which produces a smaller number), some on the diagonal. It's true that a 27-inch screen with a 1920x1200 res has a greater dot pitch than a 24-inch screen of the same res—.30mm vs. .27mm—but in our experience this hasn't proved detrimental, all other things being equal. Yes, text appears slightly more coarse with a bigger dot pitch if you examine it up close, but a larger monitor lets you view things from further away—which we appreciate.

Senior Editor Gordon Mah Ung Responds: While we haven't gotten our hands on any STEC drives as of yet, we just finished testing Intel's X25-M (page 90). In a nutshell, it's big, fast, and affordable. We'll seek out an STEC drive, as well as Super Talen's new SLC-based SSD, which claims to be the new benchmark buster.

Partition Omission

The last two or three articles about assembling a new computer haven't said anything about partitioning and formatting the hard drive before installing the OS. Are these steps no longer necessary or was this an oversight?

—Jim Harris

Editor in Chief Will Smith Responds: Well, Jim, the Windows installers will take care of the grunt work of partitioning and formatting your disk for you. The only time you need to manually set up partitions is if you want to either dual boot different OSes or store Windows and your data on different partitions. Vista (and to a lesser extent XP) don't deal with multiple partitions particularly well. With free utilities that let you resize your partitions on the fly—such as the one built into Vista or GParted—getting your partition sizes right at install isn't as critical now as it was a few years ago. If you want to resize your partitions, see our GParted how-to at http://tinyurl.com/6oxvst.

Colossal Oversight

"The 9 Most Powerful Computers of All Time" (The List, November 2008), was a very well thought out list. However, I must point out the omission of what would no doubt have been ranked second (no one can argue against M5's first-place ranking): Colossus. Let me enlighten you to a few of its abilities:

- **Colossus was designed to take control of all U.S. and Allied nuclear missiles—it launches one and shoots down one (it even detonates them in the silos).**
- **It discovers (on its own) a hidden Russian-built supercomputer (Guardian) and starts communications with it, discovers mathematics formerly unknown to man, and then creates a new binary language that only they can understand.**
- **The two supercomputers merge in to one (and you know the American computer is the dominant one, as they take the name Colossus).**
- **In the end, Colossus takes on a god-like view of the human race by declaring itself the ruler of the world and saying that in time the human race will come to respect and love him.**

How you left this computer off the list is, in the words of Nomad (another computer left off the list), "Error!"

—John W. Cranford Jr.

HOW YOU LEFT THIS COMPUTER OFF THE LIST IS, IN THE WORDS OF NOMAD (ANOTHER COMPUTER LEFT OF THE LIST), "ERROR!"

In other types of content—movies, games, digital pics—we haven't discerned any visible difference from a .30mm pitch on a quality monitor. You're unlikely to see a dot pitch higher than that on a desktop display. But your point is well taken; we'll be sure to point out when a difference in dot pitch is notable.

SSDs: The Untold Story

Love the mag, but I'm really disappointed that STEC's solid state drives weren't featured in the November issue's SSD roundup. STEC claims to have the fastest SLC-based SSDs on the planet.

Intel just released some new standard form-factor SSDs, too, so I would love to see how they perform, as well.

—Jeff

LETTERS POLICY Please send your questions and comments to comments@maximumpc.com. Include your full name, city of residence, and phone number with your correspondence. Letters may be edited for space and clarity. Due to the amount of mail we receive, we are unable to respond personally to all queries.

NEXT MONTH

COMING IN
MAXIMUM PC'S
VISIT US AT
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HOL
ISSUE

Windows Tips: Fact or Fiction
We test and review common Windows tips to show you which ones work and which don't. You won't believe this story!

ULTIMATE Antivirus Roundup!
In our biggest antivirus roundup ever, we pit the leading AV apps against one another in the ultimate battle royal. Will McAfee, Symantec, Kaspersky, F-Protect, AVG, Nod32, PC Tools, or Avast! win the belt?

Intel's Core i7—First Benchmarks!
Intel's first true quad core has finally arrived, and we've got it in the Lab. We benchmark Nehalem and find out if it's got the juice to keep AMD in second place.

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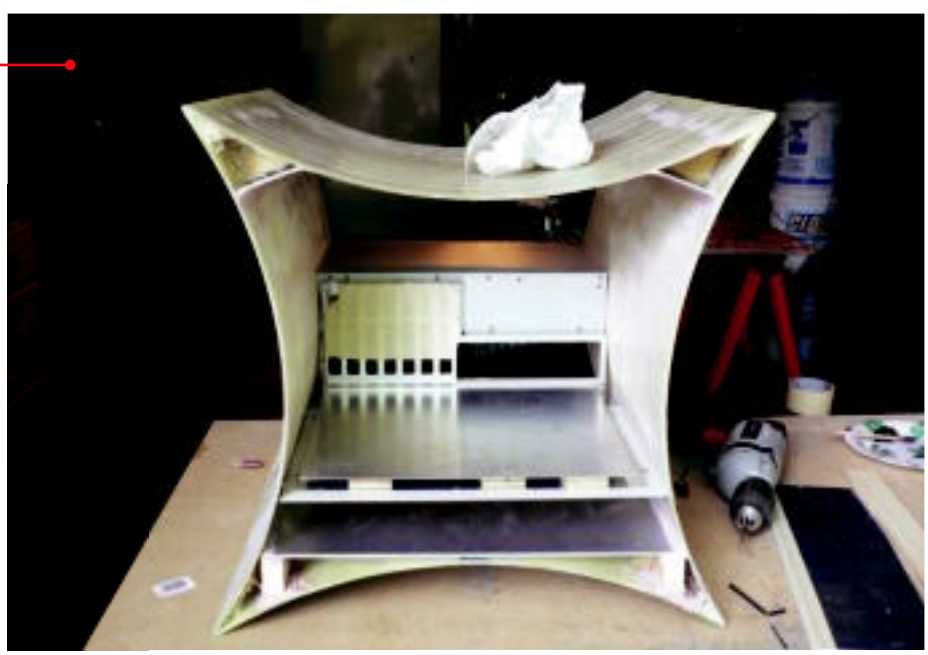
It took Erik a year of weekends to complete the Warped PC. We think it was time well spent.

A total of seven jigsaw blades were sacrificed to build this rig—two for the face plates and five for the curved fiberglass panels.

The design on the side of the case was used by Volkswagen several years ago. Erik found the oversize decal on eBay.



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